The

# Electrical Review

VOL. CII. JUNE 15, 1928. No. 2,688.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

*Chairman:* H. ALABASTER.

*Technical Editor:* A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

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Telegraphic Address "AGEEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

**For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.**

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# More about Business Methods.

THE leading article in our issue of May 18th dealt with some of the experiences of salesmen in their dealings with buyers, referring especially to an article by Mr. Earl Whitehorne in *The Electrical World* of March 17th. In a more recent issue of that paper the matter is carried further in an article by Mr. Lewis A. Jones, vice-president of the New York Power and Light Corporation. Mr. Jones is the president of the National Association of Purchasing Agents. This, we gather, is an American society with a membership of nearly 5,000. We do not know of the existence of any similar body in this country, though it is obvious that a great deal of good could be done by the discussion of the problems of buying and selling as they affect, and are affected by, different industries.

There is, of course, much to be said on both sides. It is, we think, justifiable for a buyer to expect that the salesmen who come to see him shall be adequately prepared. A purchasing agent grants an interview to a seller's representative, because he desires to ascertain the extent to which the selling firm can be of use to his own principals. To express this usefulness in the most satisfactory manner, which, after all, is the manner most likely to secure the order, the salesman needs to be properly prepared, to be primed with sufficient information about the proposition which is being put forward, to be able to answer questions, discuss projects, and advise generally as to the best means of accomplishing the object the buyer desires to achieve. Assuming that the salesmen are themselves keen, energetic, capable of absorbing and imparting information, and of such a degree of concentration and mental effort as will enable them to assimilate the material given them, whether general catalogue or tender, then, if they are not prepared to give the infor-

mation and service expected when the interview is granted, "it is," to quote Mr. Jones, "almost entirely the fault of the sales manager or the executives back in the home office."

This should be carefully borne in mind by sales managers; and, to be just, we have found, in our experience, that adequate information is generally available. Too often the assumption that salesmen will have the time and opportunity and ability to absorb the details of a lengthy technical tender for a turbo-alternator, or a main switchboard, is not warranted. In such cases the duty of imparting information concerning the offer is best carried out by two representatives. The local or branch representative makes it his business to know and to cultivate the buyers in his district, and when the need arises, he arranges an appointment for a technical representative from headquarters, whom he can introduce to the buyer, so assisting to create a favourable atmosphere for the discussion of the problem, and incidentally gaining some information himself.

In an industry such as ours it must always be remembered that the manufacturer has to live with his customers. The sale of consumable stores, like food or clothing, is rather different. In these cases, provided that the articles are of good quality, each sale is self-contained. The food is eaten, the clothing worn, and nothing more is heard of it. Electrical plant, however, is expected to function for a number of years, and although the period of responsibility for maintenance does not, as a rule, exceed six or twelve months, the occurrence of trouble five or ten years after installation will bring discredit upon the supplier. Repeat orders come in as a result of satisfactory operation, and if the operation is not satisfactory, business declines. Not only so, but it behoves the manufacturers to conduct business so that customers can obtain what they want. This is not to say that manufacturers are not to advise, suggest, and propose methods which, in their experience, have proved satisfactory for objects similar to that which the purchaser has in view. On the contrary, such advice is generally appreciated and given full consideration. Attempts at dictation are, on the other hand, liable to be strongly resented, and to create bad feeling which may take a considerable time to remove.

Instances are given by Mr. Jones of action which, when considered in cold blood, appears supremely foolish. Yet, when first conceived by those who took it, it was not intended to be foolish, but was thought to be in the interests of the selling firm. After all, it is thought, the object of business is to make profits, and if an opportunity presents itself of making a little more profit than usual, why not grasp it? Manufacturers come together, and co-operate, so as to eliminate waste effort and loss. Such business as is available will be pooled and shared, so far as practicable, between the members of the combine, or ring, or whatever it may be called. But if a buyer has a definite preference, it is folly to attempt to override it, and to force him to have something else.

The fact is, of course, that unless the spirit of service pervades business, permanent success and harmony cannot be achieved. Not all businesses can be carried on like that of Mr. Henry Ford, but in many cases some nearer approach to the ideal of service to the consumer can be reached.

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**The Engineering Conference.**

At the Conference which was held by the Institution of Civil Engineers last week in connection with the centenary of its charter, thirty discussions took place, initiated by short papers or "introductory notes." It is of interest to observe that whilst the subjects dealt with were connected with almost all departments of engineering, no fewer than ten were intimately associated with electrical engineering, and three of these might be described as purely electrical. Communication engineering, in spite of its importance, was not included within the scope of the Conference, the proceedings relating rather to materials, structures, machinery, and power; the opening notes, though commendably brief, generally summarised present-day conditions and problems, with special reference to current practice and the trend of progress, and in themselves constituted a valuable survey of engineering science. The contributors were most of them men of high rank and authority, fully competent to deal with their selected subjects. The discussions, held in three places on two mornings, naturally suffered from the necessity of condensation and hurried delivery, but will probably be amplified by communication to the *Transactions* of the Institution and will then provide a mass of useful information for the benefit of the seeker after knowledge; brief reports will appear in our columns, commencing in this issue with Mr. Archibald Page's paper on "Power Transmission" and the discussion thereon.

The fundamental changes which have taken place in engineering practice in recent years, and which are still rapidly evolving, are well illustrated in the notes and discussions. The use of fuel received much attention, and we note that Lord Weir and Mr. H. E. Yarrow, referring to the adoption of improved methods of burning coal on board ship, said that a successful solution of the problem "would open a new era in marine propulsion and would substantially assist the British coal situation"; in our issue of May 25th (p. 893), we pointed out the great importance of this subject to the electrical industry. The construction of boilers capable of working at high pressures and temperatures was also a prominent feature of the proceedings at the Conference; electricity is interested not only in the use of such boilers in power stations, but also in the manufacture of the special steels required, for which the electric furnace is the most suitable agency. Mr. W. H. Patchell, himself a pioneer of the "big boiler" movement, mentioned boilers at work having a capacity of 500,000 lb. per hour—a gigantic output—and spoke confidently of the use of high pressures, which has not brought with it the troubles that were expected. Similarly, Dr. S. L. Pearce treated large sets and high pressures and temperatures as standard practice, though he appeared doubtful whether it was necessary to adopt the largest sizes in this country. He gave some figures of comparative costs, and indicated that a pressure of 600 lb. per square inch appeared to offer greater commercial advantage for a base-load station than higher or lower pressures.

On the other hand, progress is being made in the design of internal-combustion engines, and it is startling to learn from Mr. H. R. Ricardo that "the output of high-speed internal-combustion engines to-day exceeds by more than ten times in total horse-power that of all power-stations, ships, and railways"!

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**Electricity in Gloucestershire.**

Not often do we have opportunities of describing power stations in the lay-out of which unusual features are incorporated, since the generation of electricity is now proceeding along more or less standardised lines. Last week, however, attention was drawn to the Bristol Corporation's new plant that is being built at Portishead, with its novel arrangement of steam-condensing plant and associated water ducts, and this week an account is presented of the West Gloucestershire Power Co.'s undertaking.

Situated in the Forest of Dean, one of the oldest coal-mining areas in the British Isles, and of historic interest to electricians, the rapidity with which the Company's generating station was built is a noteworthy feature: it is located quite close to a colliery, from which it is fed with fuel direct by means of belt con-

veyors and, moreover, the river water which is utilised for condensing purposes contains a large proportion of water pumped from the mines. Operating in districts which are rural in character, the Company's transmission and distribution systems are largely overhead, with associated outdoor sub-stations, and the laying of duplicate 33-kV submarine cables across the River Severn was a feat of some magnitude carried out in a remarkably short time.

The Company's Sales Department is characterised by its energetic canvassing of prospective consumers, and the display of out-of-the-ordinary solicitude on their behalf, even carrying out experiments in an endeavour to solve their particular problems; close co-operation with local electrical contractors is maintained for mutual assistance and consumers' satisfaction. Domestic electrification is on the increase, and all-electric houses have produced interesting results. Whilst the Company's tariffs have been designedly framed in a somewhat complicated manner, no particular difficulties have been experienced in that respect; the application of a kVA tariff has proved to be beneficial.

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**The I.M.E.A. Convention at Bath.**

As we indicated last week, the keynote of this year's Convention is the distribution of electricity and domestic electrification, and the President concluded his opening address (which is reprinted in abstract elsewhere in this issue) with an exhortation to the members to develop the sale of electricity by every means in their power, particularly referring to the framing of suitable tariffs, the adoption of up-to-date selling methods, the taking of electricity to the consumer instead of waiting for him to ask for it, and the giving of efficient service; all these are points of policy which we have repeatedly advocated, and we agree with the speaker that if the position is faced with courage and determination, the resulting demand will eventually tax the capacity of the electricity supply industry to cope with it.

The greater part of the President's address, however, was devoted to a lively commentary on the Electricity (Supply) Act, 1926, for which he showed no love whatever; indeed, his onslaught was not directed only against the main principles and provisions of the Act, but was carried through even to the remote recesses of the Schedules. Mr. F. W. Purse makes it clear that he disputes the statistical basis of the Act, denies the alleged advantages of concentrated generation, sees no prospect of cheaper electricity, and quarrels with the terms offered to "selected" stations; moreover, he cites American experience with respect to the difficulties arising out of extensive interconnection, and casts doubt on the reliability of high-pressure overhead lines. In the main, of course, we are in agreement with Mr. Purse; during the passage of the Bill we did our best to expose the fallacies with which it was infected, and to secure its amendment whilst there was yet time. But, with few exceptions, the electricity supply industry had not the pluck to stand up in public for the opinions which it certainly held and freely voiced in private; it is true that the I.M.E.A. and the Council of the I.E.E. passed resolutions adverse to the Bill, but they let it go at that and offered no effective opposition. It is too late now, and whilst we sympathise with Mr. Purse, we suggest that time is better spent in seeking to make the best of the conditions that have been forced upon the industry than in crying over spilt milk. As he says, the Central Board and the electricity supply authorities "must work together in sympathy and co-operation." The Board is very willing to pursue that policy, and we believe that it will do its utmost to secure and retain the goodwill of the whole industry and of the community it serves.

**Administration of Electricity Supply Undertakings.**

THE paper read by Colonel Alexander Sinclair and Mr. J. W. Burr at the I.M.E.A. Convention is timely, inasmuch as it directs attention to the broad principles which should be considered in directing the course and policy of electricity supply. Naturally it is concerned with municipal undertakings, and both the authors have many years of experience behind them.

Stress is rightly laid on the desirability of suitable committees. The present system, of choice from among the members of a council, without regard to experience or knowledge, has worked for a number of years, but it has been obvious all the time that it left much to be desired. The members of the council themselves are persons who offer themselves voluntarily for election, well knowing that their time will be very fully taken up with work which will bring them more criticism than approbation. The most suitable men are often deterred from the useful work they might do by the prospect of a contested election, and of becoming involved in contentious matters which, while their importance may be considerable, do not bear directly on the particular activities of the corporation and its undertakings.

As long ago as 1907, Mr. S. E. Fedden, in his presidential address to the I.M.E.A. Sheffield Convention, pleaded for the continuity of the chairman as well as of the engineer. Col. Sinclair and Mr. Burr carry the idea rather further, but there is no doubt that they are right. The direction of the policy of great commercial undertakings, in which millions of public money are invested, and on which the activities of the industrial population so largely depend, should be in the hands of men who are not liable, as soon as they have acquired some experience, to be replaced, at the behest of a party majority, by others who have that experience still to gain.

The importance of getting the right staff and of promoting the right relations with them is emphasised. Financial administration is considered, including the reserve fund, the appropriation of surplus revenue, the once vexed question of contributions in aid of rates, the assessment of the undertaking for purposes of local rates, the finance and redemption of capital expenditure, and the provision of working capital from the revenues of the undertaking.

It is to be noted that the proposals of the Chancellor of the Exchequer for assisting industrial undertakings by paying a proportion of their rates from national resources do not extend to electricity supply concerns. While it may be argued that they are not in such dire need of assistance as the steel and cotton and coal industries, it may equally be argued that industry in general is now so dependent upon electricity that any means of cheapening it will be of general benefit, and that the subsidy in aid of rates is justifiable.

Generation, distribution, and sales policy are dealt with adequately. Generation, under the schemes of the Central Electricity Board, will be carried on by fewer and larger stations. Distribution will increase in importance, and is the business of every undertaking, whether municipal or not. Moreover, on its adequacy depends the very possibility of a sales policy. What is the use of persuading people to go in for electric cooking, heating, washing, cleansing, freezing, and all the rest of it if the mains, as in the case of even some of the largest companies in London, are not large enough? It is false economy to lay down distributors suitable for the next one or two years' developments. While the ground is open, the opportunity should be taken of laying cables that will be large enough at the end of five or ten years.

Granted adequacy of supply and distribution, we think the desirability of a well-directed publicity department and a brisk sales policy is well recognised.

We do not doubt that Messrs. Sinclair and Burr's paper will excite much discussion, and it should be productive of good to the industry at large. A similar dissertation upon the administration of company undertakings would be equally useful.

# Guildford Electricity Works.

**The new Woodbridge Road power station has a plant capacity of 6,000 kW, and is the first section of a works designed for a final capacity of 42,000 kW.**

In our last issue we briefly referred to the official opening of the new electricity works of the Guildford Corporation, which took place on May 30th; we are now able to give a fuller account of the station, and of the undertaking generally.

**Fig. 1.—Station Exterior; Coal- and Ash-handling Plant.**

Public electricity supply was started in Guildford in 1896 by the Guildford Electric Supply Co., whose output in the first year was about 15,000 units. The Company carried on the undertaking with varying results, but after the termination of the Great War it entered upon a very bad time. Through various causes the supply of current was frequently interrupted, and, in consequence, pressure was applied to the Corporation in 1920 by a considerable number of prominent business men for it to acquire the undertaking. The Corporation entered into negotiations with the directors of the Company, and the undertaking passed into the ownership of the municipal authority in October, 1920. Steps were at once taken to rearrange the whole system, and the undertaking has since made great strides. In 1926 the Electricity Committee had to consider seriously the question of extension; the generating plant at the Onslow Street station was being run at its fullest capacity, and no space was available there for additional generators. After consultation with the Electricity Commissioners, plans were prepared which provided for the erection of an entirely new generating station on an ideal site at Woodbridge Road, adjacent to the River Wey and the Southern Railway, and the adaptation of the Onslow Street works as a converting and distributing station. The plans for the new station provided for the immediate installation of two 1,500-kW and one 3,000-kW turbo-alternators, but the building is so arranged that it can be extended for an ultimate capacity of 42,000 kW. The contract for the complete station at Woodbridge Road was placed with Messrs. C. A. Parsons and Co., Ltd. The foundation stone was laid in February, 1927, and the first machine was put on load in the following November. The contract for the building was sublet to Messrs. Industrial Constructions, Ltd. It is a steel-framed structure with brick filling.

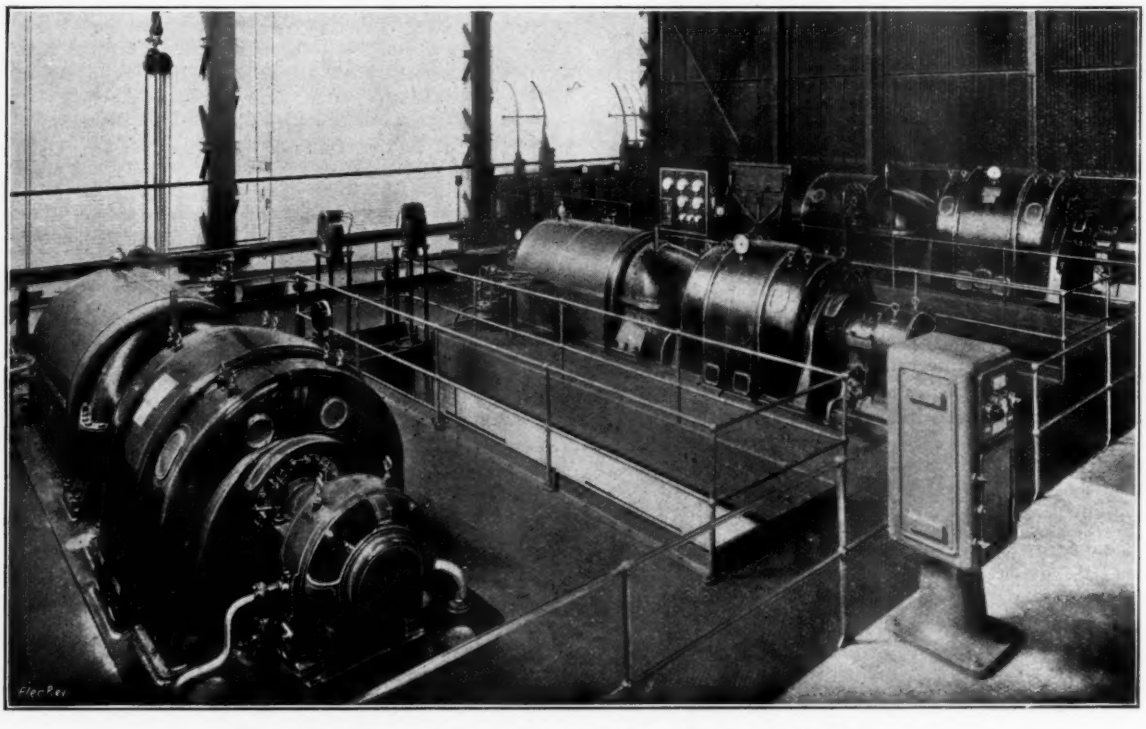


**Fig. 2.—The Turbine Room; One 3,000-kW and Two 1,500-kW Sets.**

The power station proper (fig. 1) comprises a boiler house, 88 ft. wide by 61 ft. deep and 70 ft. high to the

eaves, an engine house of the same depth and 59 ft. in width, and a switch house 18 ft. wide.

The whole of the steam-raising, coal- and ash-handling plant was supplied by the Stirling Boiler Co., Ltd. Coal is brought to a storage dump, from which it is picked up by an overhead telpher, fig. 1, and transported to the boiler-house bunkers. The supply to the boilers is controlled by duplex coal valves. Two boilers installed, fig. 3, are of the latest type Stirling tri-drum water-tube apparatus, with Stirling integral superheaters, each normally evaporating 40,000 lb. of water per hour with steam at 290 lb. per sq. in. and 750 deg. F. Each boiler has a total heating surface of 7,327 sq. ft., and each unit includes a Stirling steel-tube economiser. Seven Scot blower elements keep the boiler and economiser surfaces free from external deposits. It is claimed that the boiler plant will operate at an efficiency of 83½ per cent. Each boiler is served by a separate chimney, and both forced and induced draught are provided. The gases are discharged through grit arrestors at the chimney bases. Each boiler is equipped with two travelling-grate stokers supplied by the Underfeed Stoker Co., Ltd.

From the hoppers at the rear of the stokers the ash falls into a submerged drag-link conveyor, which carries it to a bunker outside the building, fig. 1, from which it can be discharged into trucks. Each boiler is provided with a fully-equipped instrument panel.

As already indicated, there are two 1,500-kW and one 3,000-kW turbines installed, 3,000 r.p.m., fig. 2. These were supplied by Messrs. C. A. Parsons & Co., Ltd. The stop-valve conditions are 250 lb. per sq. in. and 700 deg. F. The 1,500-kW turbines are of the single-cylinder design and incorporate blading of the Curtis, Rateau and Parsons principles, in that order from the inlet to the exhaust. The larger machine is also single cylinder, but of the purely reaction type. Arrangements are made for extracting steam from each machine at a

**Fig. 3.—One of the Boilers; 40,000-lb. per hour.**

pressure of about 15 lb., abs., for heating the feed water to a temperature of 180 deg. F.

Each turbine has its own surface condensing plant, also of Messrs. Parsons's manufacture. The condensers are all arranged three-flow. Steam-jet operated "ejector" air pumps are installed for each unit, and each comprises a primary jet which exhausts into an auxiliary condenser, and a secondary steam jet which exhausts into a feed-water heater. The condenser and feed-water heater are embodied in one casting, and the main condensate from the condensers is used as cooling water in order to conserve the latent heat of the operating steam from the jets.

The circulating water for the condensing plant, obtained from the River Wey, enters the intake bay through two 10.5-ft. Ledward & Beckett rotary screens. These are operated by means of a Pelton wheel, through

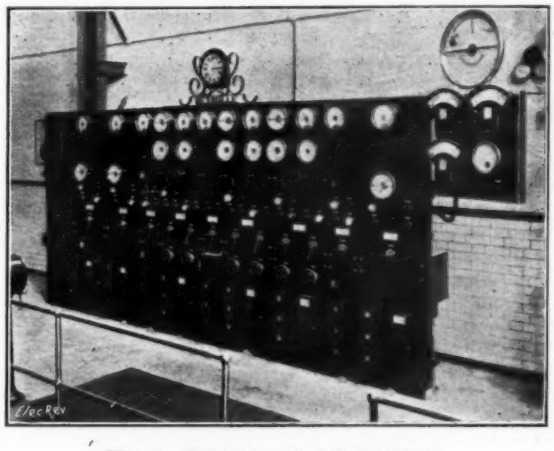



**Fig. 4.—Remote-control Switchboard.**

reduction gear, the water supply for this being taken from the circulating water bus main in the pump house. The pump house is equipped with two electrically driven vertical-spindle centrifugal pumps, manufactured by Messrs. Pulsometer Engineering Co., Ltd., each having a capacity of 250,000 gallons per hour, against a 27-ft. head. These pumps deliver through a 36-in. main to the condensers, situated 450 ft. away, and the discharged water from the condensers is carried away through a similar main.

The alternators are also of Messrs. Parsons's manufacture and generate at 3-phase, 50 cycles, 6,600 volts. The rotor bodies are solid-steel forgings, with the windings embedded in radial slots milled out of the solid. The cooling of the alternators is carried out on the closed-circuit system of forced ventilation.

The whole of the switchgear is of the metal-clad type, manufactured by Messrs. A. Reyrolle & Co., Ltd. The main switchboard, as originally ordered, consisted of three 6,600-volt, 3-phase, oil-immersed circuit breakers of the horizontal draw-out type for the three alternators, two for two 200-kVA transformers supplying current in the power station for the auxiliaries and the lighting, two for outgoing high-pressure feeders, and one for use as a bus-bar coupler, the switchboard being of the duplicate bus-bar type. Since the board was erected it has been decided to add another feeder circuit breaker to control the supply to a section of network near the power station. The circuit breakers are suitable for an ultimate plant capacity of up to 50,000 kW. Their breaking capacity is 500,000 kVA, and they are fitted with protective gear of the self-balance type for the alternators, and of the standard Merz-Price type for the transformers and the feeders. The circuit breakers of the main switchboard are operated by solenoids energised from a control board, fig. 4, fitted with all the switches necessary for remote operation. In addition, the control board carries an automatic voltage regulator for the alternators and the usual instruments. A neutral earthing resistance for the three alternators is provided and coupled to the neutrals through three single-phase draw-out-type circuit breakers built together into a small separate switchboard. The two transformer circuit breakers in the main switchboard are connected to the primary sides of the two 200-kVA 6,600/400-volt transformers, the secondary sides of which are coupled to the two incoming circuit breakers of a distribution board which controls the station auxiliaries and lighting.

# Electricity Supply in Gloucestershire.

**A description of the Lydney power station in the Forest of Dean, which was in commercial operation six months after the building contract was signed, together with a record of the development of the West Gloucestershire Power Co., Ltd.**

COMPRISING nearly 22,700 acres, bounded by the Rivers Severn and Wye, the Crown property known as the Forest of Dean is but little known, except to inhabitants of its immediate vicinity. Abounding in scenic richness and of never-ending interest to the historian, naturalist, botanist, and geologist alike, it is coal-bearing too, Freemen of the Forest having the right by ancient charter to mine coal: the workings are generally illuminated by naked flames, as the coal-field is very wet and dust and firedamp have not to be contended with. Some of the first electrical machines manufactured are still to be found all over the Forest, wherein is claimed to be situated the first colliery in the world to be fitted with electric motors.

Realising that the availability of electricity would considerably influence the development of the mineral resources of the Forest of Dean and the woollen and allied industries of the Stroud Valley, the West Gloucestershire Power Co., Ltd., was formed in 1923 under the chairmanship of Mr. John Davidson and the general management of Mr. Harry S. Ellis, M.I.E.E., M.I.Mech.E., who is also the Company's chief engineer, its advisory engineers being Mr. Arthur Ellis, M.Cons.E., M.I.E.E., and Mr. W. B. Woodhouse, M.Inst.C.E., M.I.E.E., M.I.Min.E.

H.M. Electricity Commission having sanctioned the scheme, which was financed by the British Empire Trust Co., Ltd. (the present area of supply being outlined on the accompanying map, fig. 1, which also indicates the existing and projected transmission-line routes), the contract was placed with the Foundation Co., Ltd., which created what is claimed as a world's record by installing the first 5,000 kW of plant in time to enable energy to be delivered to a colliery 10 miles away on a commercial scale just six months after the building contract was signed in December, 1922, since when the station has maintained an uninterrupted supply. Furthermore, within a year the station had been completed by the installation of another 5,000 kW of generating plant, the building of a 33-kV outdoor sub-station, the erection of 40 miles of overhead transmission lines with subsidiary sub-stations, and the laying across the River Severn of duplicate e.h.p. submarine cables, feats that may be described as remarkable.

The achievement emphasises the advantage of making one company entirely responsible for the whole of the contract, and so enabling it to eliminate, by energetic application and forethought in the early ordering of plant, the common delays of contract work caused by the completion of one portion having to depend upon the delivery of another. The larger the undertaking the greater are the benefits of speed of completion, for the manifest primary advantages of an abridgement of the time that must necessarily elapse between the clearing of the site and commencement of the supply of energy are an earlier return upon the capital expended and a definite reduction of the total amount of money needed; the first consideration obviously eases the finance of such schemes, while the second reduces the production cost per kWh generated, and is thus directly beneficial to the consumer.

Having previously served as a dump for colliery refuse, the site of the station had to be cleared to a depth of about 15 ft. to permit of the red-brick-faced

**Fig. 1.—Area of Supply of West Gloucestershire Power Co., Ltd., showing Transmission Lines.**

steel-framed concrete structure being bedded on rock. Glazed roofs admit plenty of light to the boiler house and engine room, the inside walls of the latter being faced with white glazed bricks.

Situated in the Lyd Valley close to the main-line Severn and Wye railway down which the bulk of the coal mined in the Forest passes, the generating station's proximity to the Norchard Colliery is a feature of its lay-out: from a Merrick belt weigher in the colliery sidings the fuel is conveyed a distance of 250 yards by means of Fraser & Chalmers electrically-driven overhead belts of a capacity of 100 tons per hour to the bunkers above the boilers (figs. 2 and 3). Each of the three Stirling boilers (figs. 4 and 5) normally evaporates 35,000 lb. of water per hour, and each is provided with two chain-grate stokers, the depth of the fire being regulated by guillotine doors; they are so arranged that the flue gases from two boilers pass up one chimney, one 65-h.p. induced-draught fan operating on each pair of boilers. Two 160-h.p. turbine-driven Weir pumps are each capable of serving two boilers on

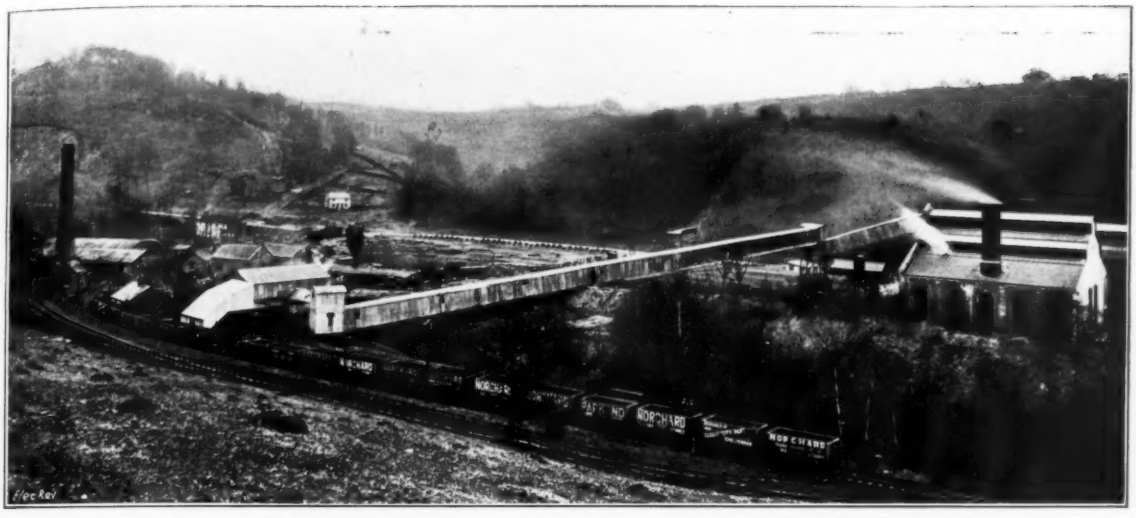
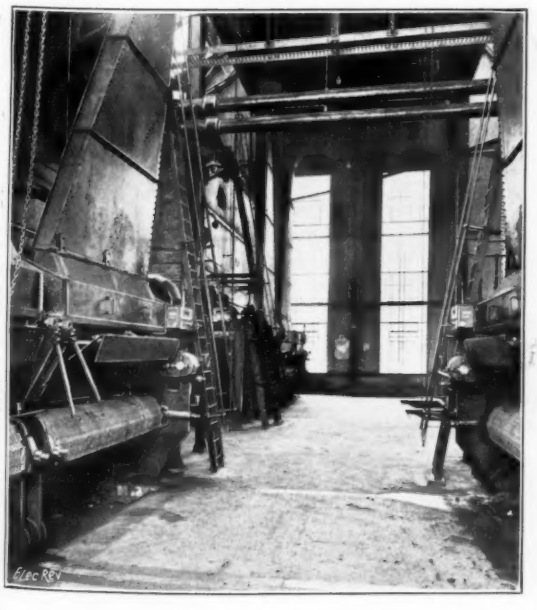
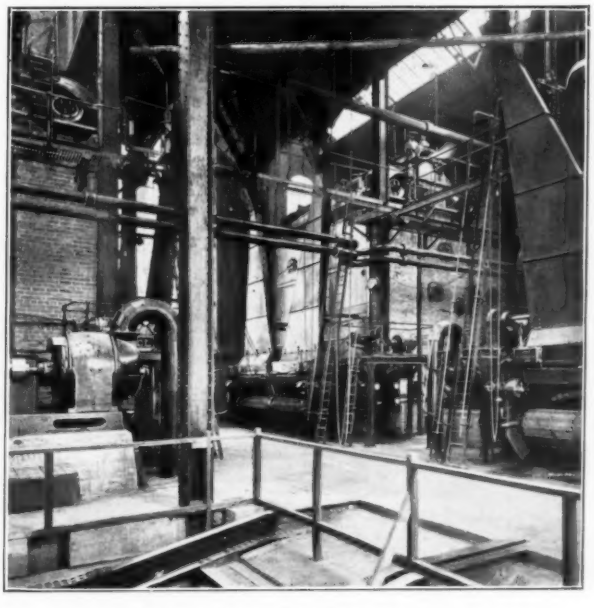



Fig. 2.—Lydney Power Station, showing Coal Conveyor from adjacent Colliery on Left.

Fig. 3.—Fuel Conveyor along Apex of Boiler-house Roof.



Figs 4 and 5.—Two Views of the Boiler House at the Lydney Generating Station.

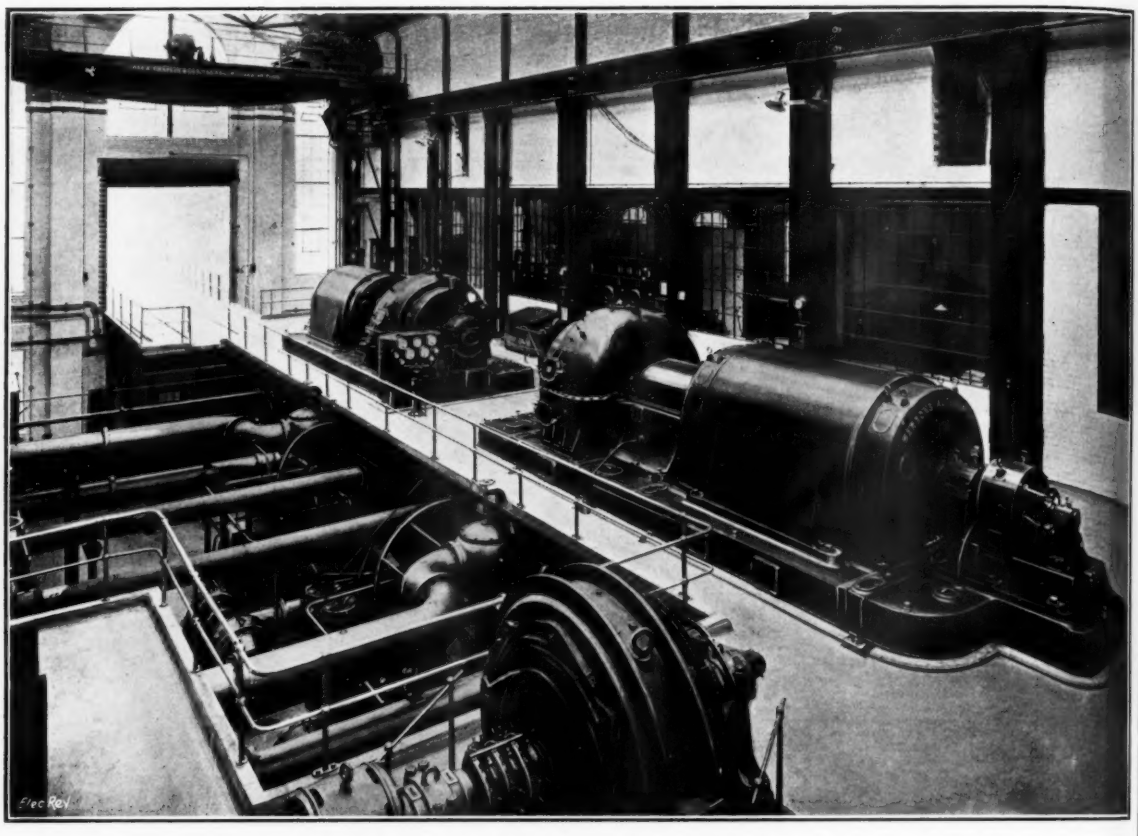


Fig. 6.—Turbo-generator Room, Lydney; Control and Switch Room Window on Right.

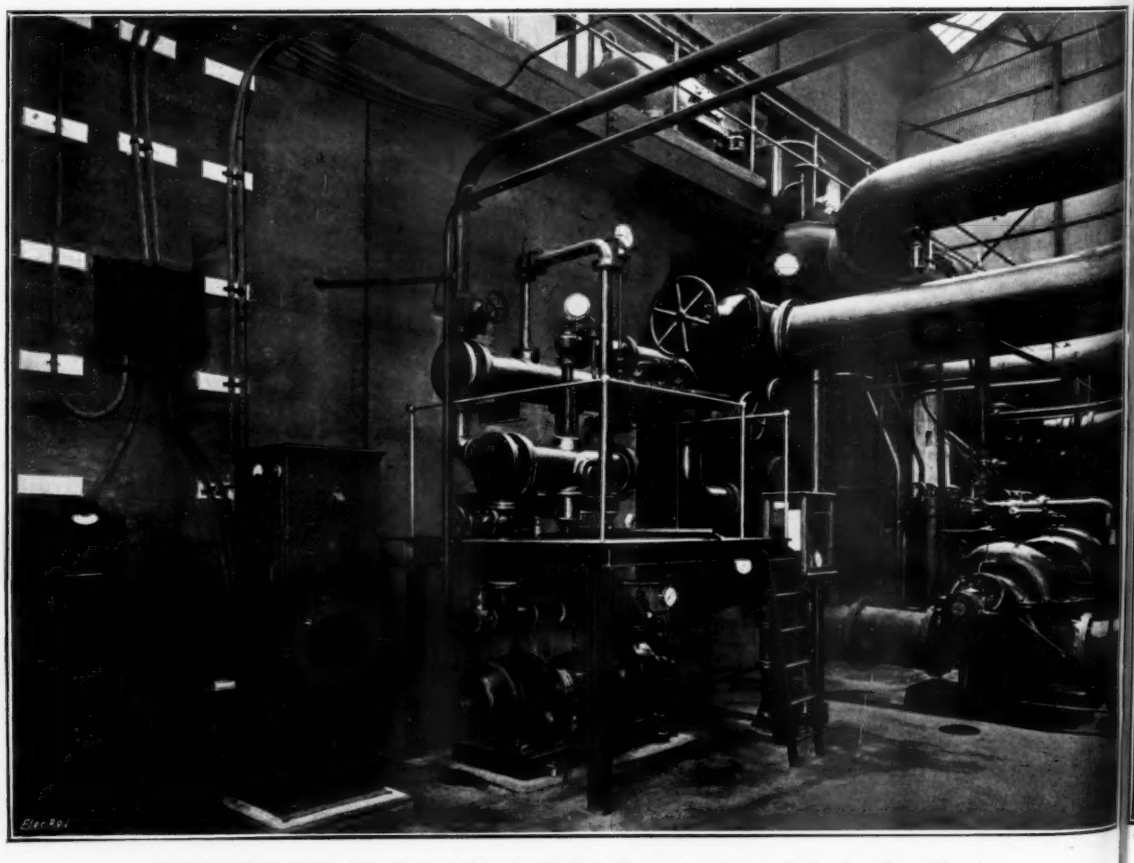
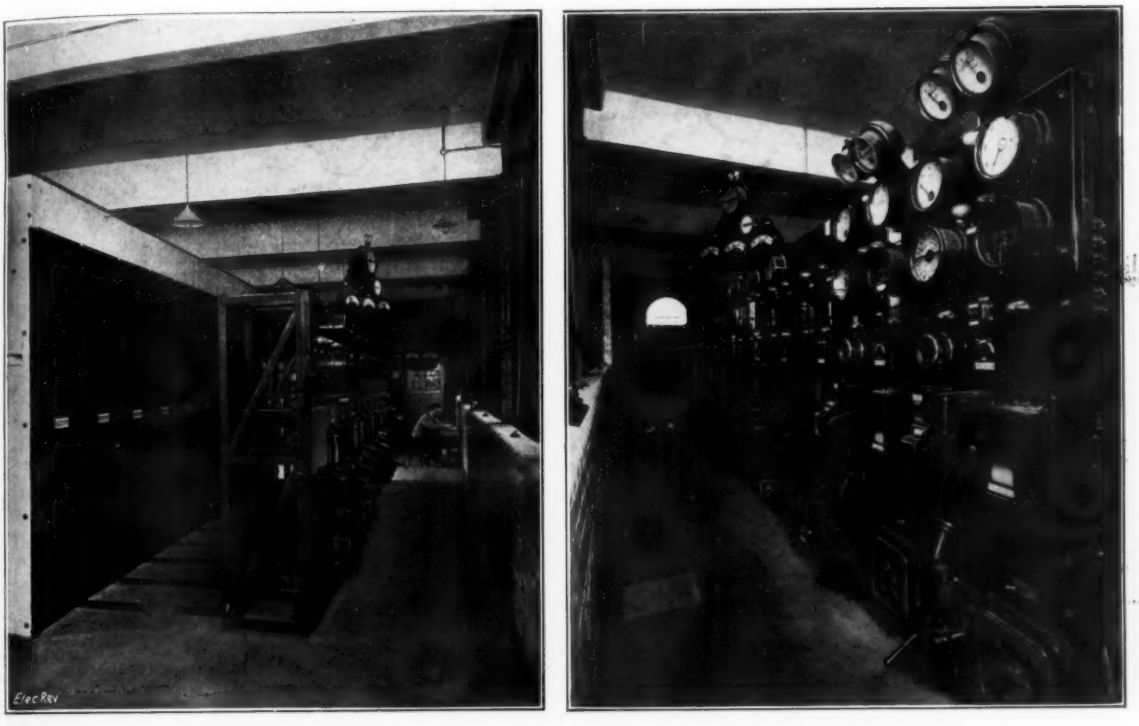


Fig. 7.—One of the Condensing Pits, indicating the arrangement of the Auxiliary Plant.



Figs. 8 and 9.—Two Views of the E.H.P. Switchgear Cubicles and Control Board.

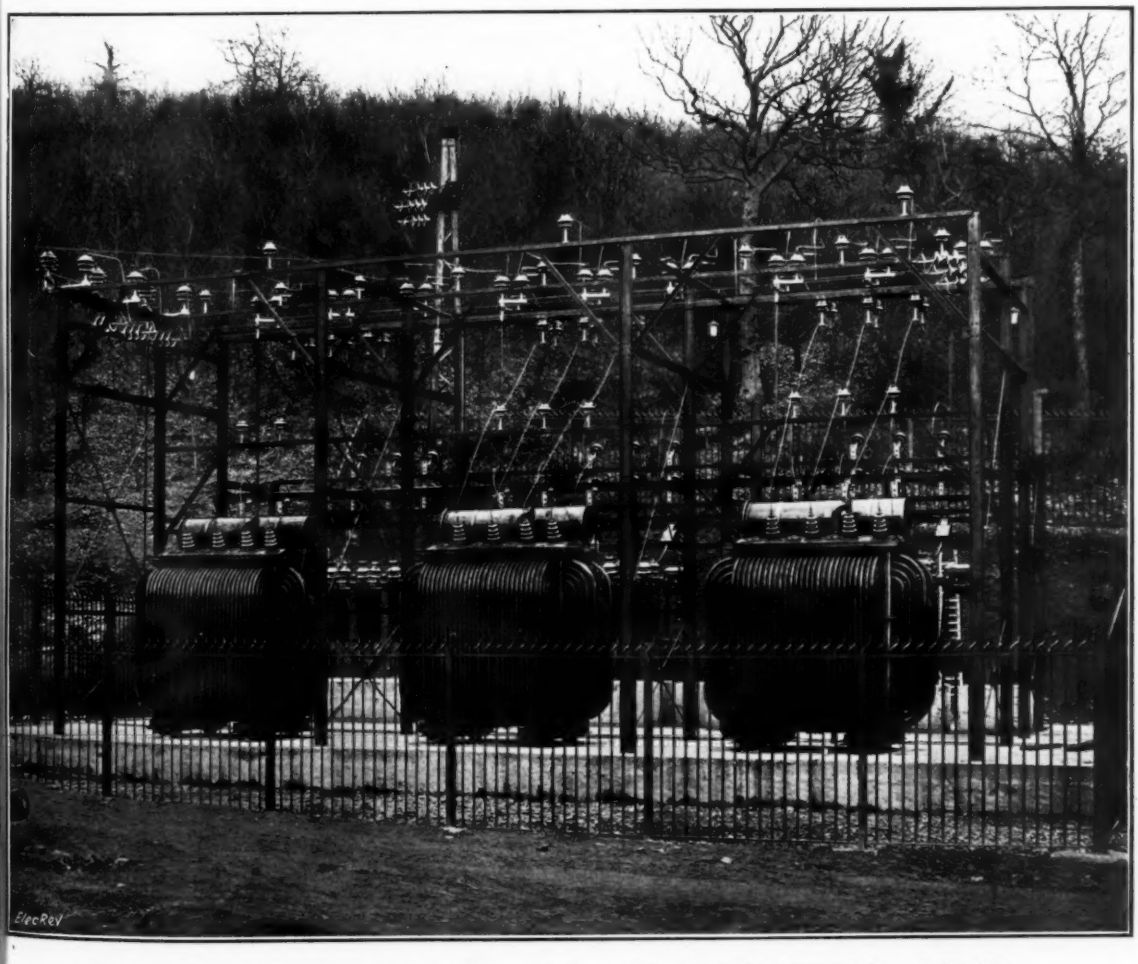


Fig. 10.—Main 6,600/33,000-volt Sub-station at Lydney, Stepping-up for Transmission, 9,000 kVA.

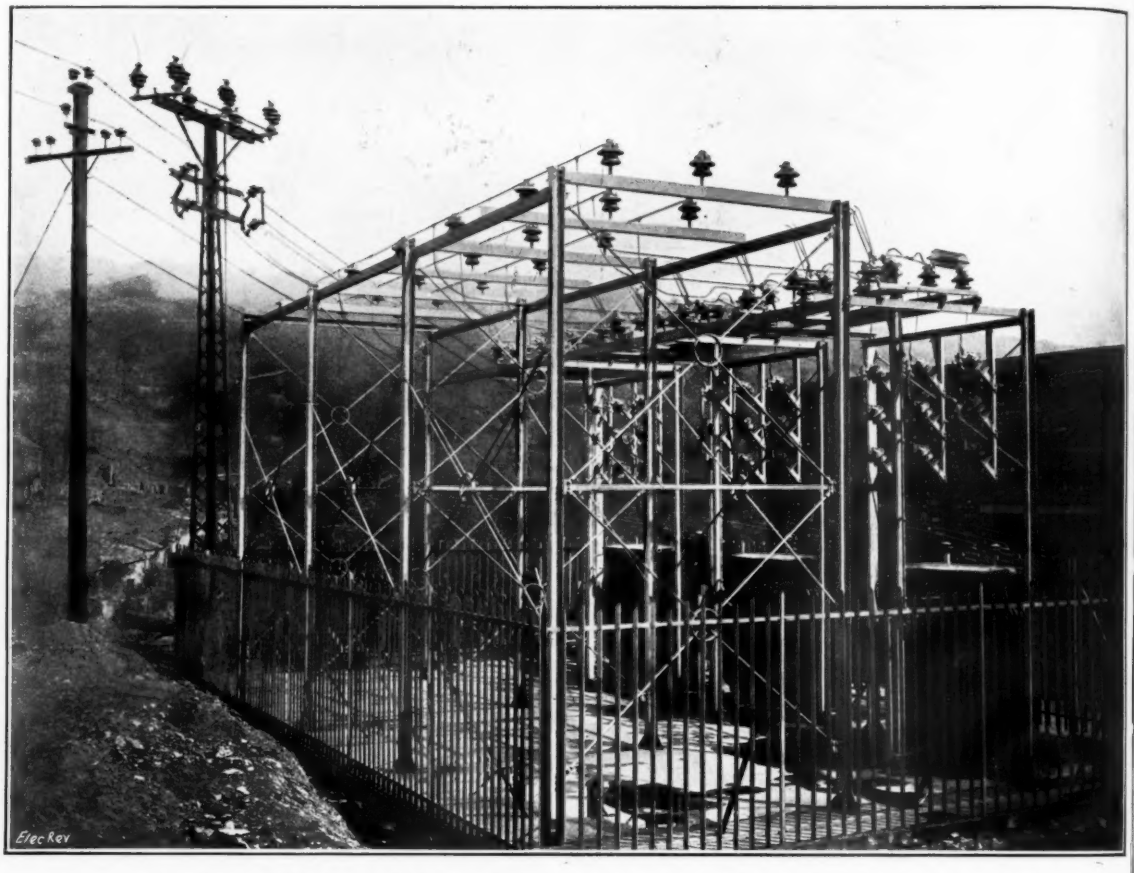



Fig. 11.—A 1,500-kVA, 33/3·3-kV Transformer Sub-station, showing Air-break Switches and Fuses.

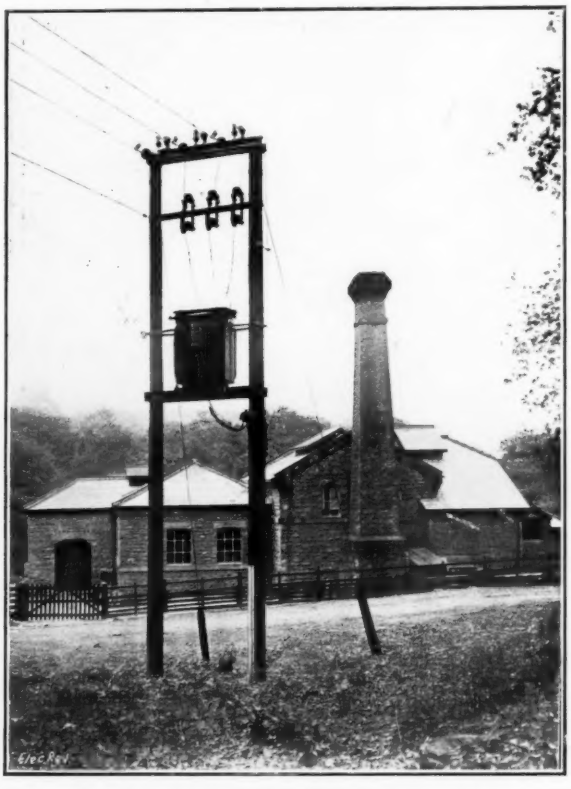



Fig. 12.—East Dean Waterworks Sub-station.

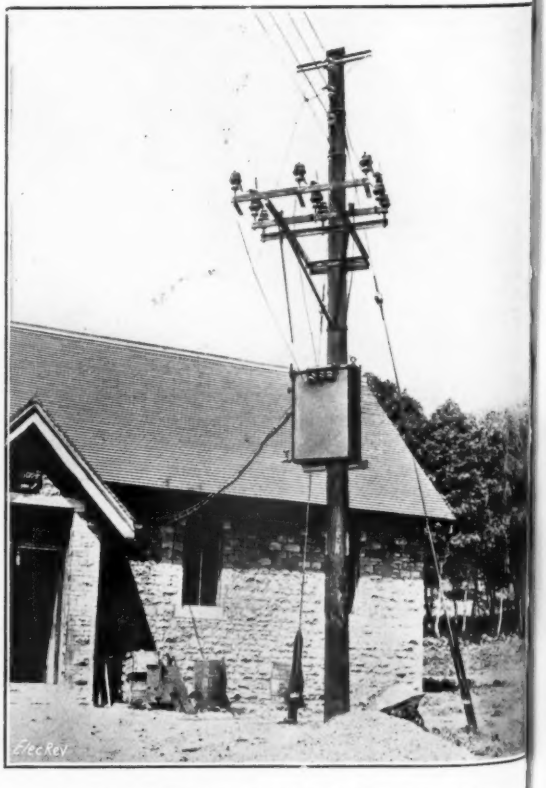



Fig. 13.—Aylburton Pumping Station Sub-station.

the closed-feed system, all make-up water passing through a Caird & Rayner evaporator of 5,000 lb. per hour capacity. Vacuum soot-extraction plant has been provided and the ash is carried from the boiler basement hoppers in trucks, from which it is picked up and conveyed by an aerial ropeway to the ash dump.

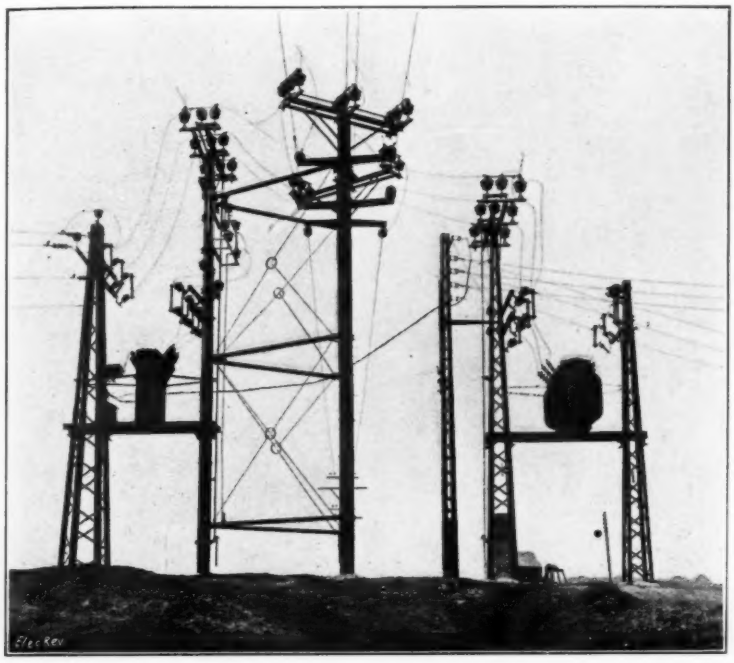


Fig. 14.—Cinderford Step-down Sub-station.

The generating plant (fig. 6) consists of two Belliss and Morcom impulse turbines directly coupled to Parsons 5,000-kW, 3,000-r.p.m., 6,600-volt, 3-phase, 50-cycle, 0.8 p.f. alternators. Each set is provided with oil coolers and an air washer, the ventilation of the alternators being maintained by separate motor-driven 30-h.p. fans. A third turbo-generator set (of 7,500 kW capacity, 10,000 kVA m.c.r.) has been ordered and will be installed this summer.

The Worthington-Simpson condensing plant (fig. 7) is of the surface type, each set having a cooling surface of 7,500 sq. ft. and being capable of maintaining a vacuum of 28.5 in. The steam-jet Worthington-Simpson air ejectors are provided with inter- and after-coolers, and the condensate is extracted by motor-driven pumps, being utilised for the air-ejectors' cooling jackets, after which the water is returned direct to the hot well, thus forming a complete circuit. The circulating-water pumps are each capable of dealing with 5,000 gallons per minute, being driven by variable-speed motors so as to allow of the use of artificially-cooled water should it become necessary to do so at a later date. Normally, however, condenser cooling water is drawn from, and returned to, the River Lyd. As has already been hinted, the mining of coal in the Forest of Dean involves a considerable amount of pumping, and a large quantity of water consequently flows down the valley in the river.

As is indicated in figs. 6, 8 and 9, the switch room adjoins and overlooks the turbine room: the 6,600-volt gear is of the Ferguson, Pailin mechanically-operated stoneware cellular pattern. A low-voltage a.c. F.P. switchboard controls some of the station auxiliary plant, which derives its energy from the main bus-bars through Ferranti transformers; the remainder of the auxiliary machines are controlled from a 500-volt d.c. board that is fed by two 1,000-kW Metropolitan-Vickers rotary convertors, which also furnish a supply of d.c. to local consumers.

The engine room is spanned by a 30-ton Chaplin electric travelling crane; all the station motors are of B.T.-H. make, and the station cables were manufactured by Callender's Cable & Construction Co., Ltd. As a stand-by in case of emergency, a 100-kW Terry 500-volt d.c. geared turbo-generator set was installed.

Fig. 15.—Ryeford-Gloucester 33-kV Line.

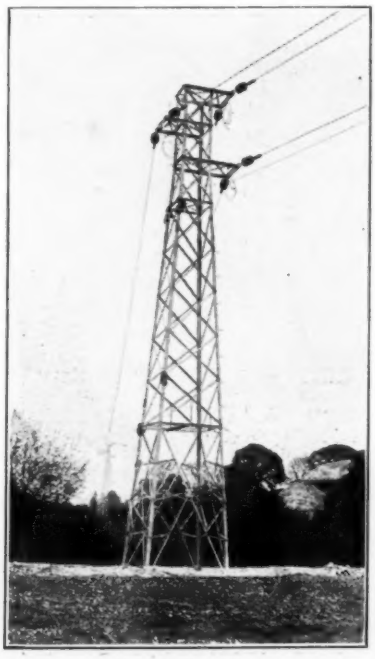


Fig. 16.—Angle Tower, 33-kV Line, Steel-cored Aluminium.

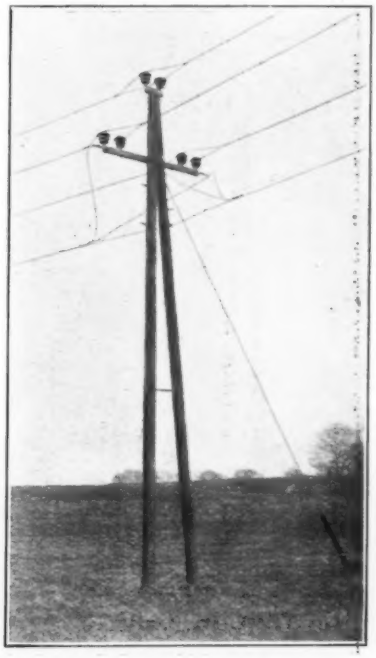


Fig. 17.—"A" Angle Pole with Stay and "V" Guards.

D

The energy generated at 6,600 volts is fed through the h.p. switchgear to the main outdoor sub-station* (fig. 10) some 300 yards from the generating station, which steps up the pressure to 33,000 volts for transmission. The three 3,000-kVA Ferranti transformers (a fourth 3,000-kVA set is to be added this summer) are of the core type with circular-coil concentric windings (l.p. spiral, h.p. disk); spring clamps are fitted at the centre of each set of coils to automatically take up any slight shrinkage which may develop during operation. Each welded tank has an oil conservator vessel and calcium-chloride breather, oil-level gauge, thermometer pocket, oil-drum valve, oil-filter valves at top and bottom, and swivel rollers which enable the transformer to be moved in any direction.

The next four of the accompanying illustrations represent typical types of sub-station on the Company's distribution network of overhead mains. Fig. 11 shows three 500-kVA, 33,000/3,300-volt transformers forming a step-down sub-station, with air-break switches and fuses. Fig. 12 shows the 100-kVA. 6,600/400/230-volt sub-station serving the East Dean waterworks pumping station, which was recently converted to electric drive. while fig. 13 is a view of the 30-kVA 2,200/400/230-volt pole-mounted transformer which feeds the Lydney waterworks pumping station at Aylburton. Fig. 14 is a view of the Cinderford sub-station: 33,000/6,600 volts, 250 kVA, and 33,000/400/230 volts, 75 kVA; the method of tapping the main 33-kV transmission line is also indicated.

The Company's area of supply (fig. 1), including the district scheduled in its 1927 Special Order which has been recently confirmed by Parliament, comprises roughly 500 sq. miles, with a population of some 150,000 people. The length of 33-kV overhead transmission lines already in operation totals 49 miles, and the system is at present being extended: about 30 miles of line is being erected by the Pirelli-General Cable Co., Ltd., between Lydney and Gloucester, and between Gloucester and Stroud, which, with the present line to Stroud, will form a ring main some 45 miles long, thus ensuring duplicate supplies for the districts served by it.

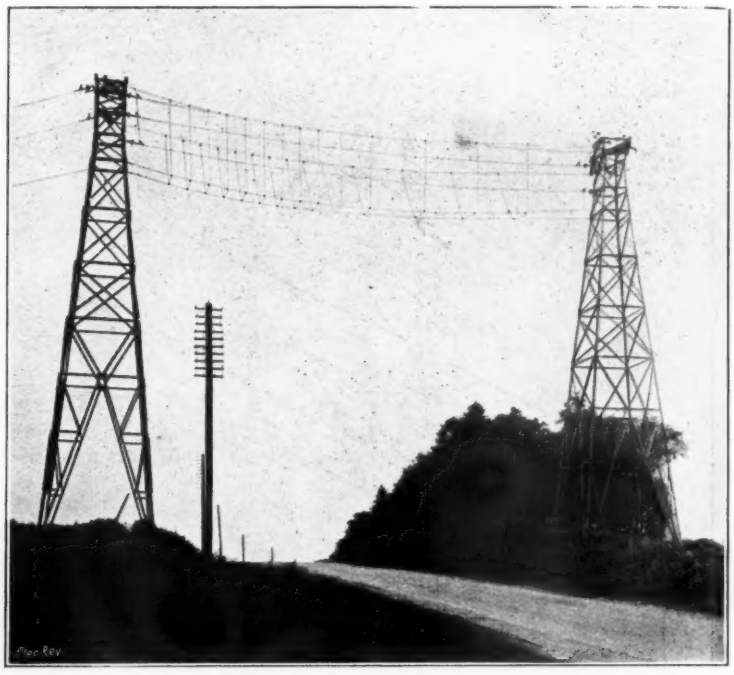


Fig. 21.—Road and Telephone Line Crossing, 6,600-V Distributor.

Primary distribution is carried out at 6,600 and 2,200 volts, 20 miles of overhead lines operating at the former voltage being already in service, and 3.5 miles of overhead lines operating at the latter pressure. Low-pressure distribution is carried out at 400 volts three-phase for power, and at 230 volts single-phase for lighting, heating, cooking and other domestic uses. The

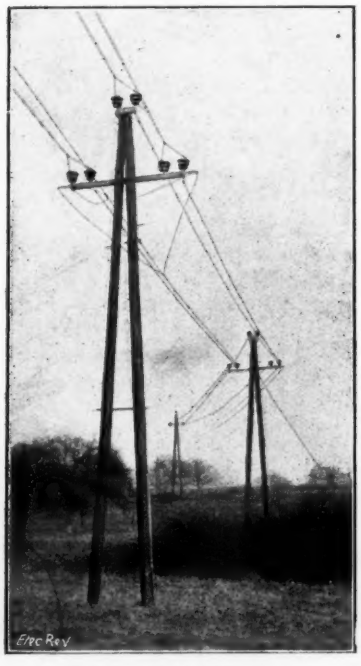


Fig. 18.—Road Crossing, 33-kV Line.

Fig. 19.—Mitcheldean Distributor, 6,600 V.

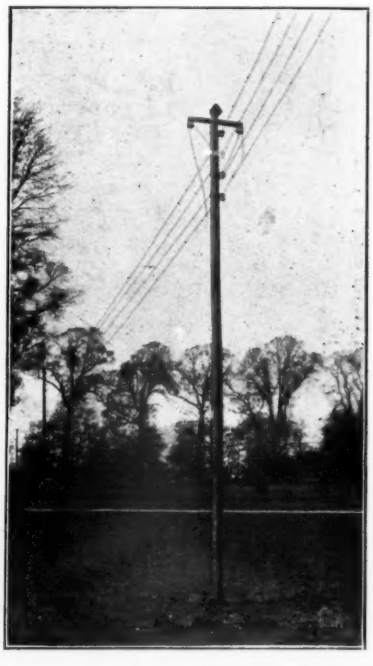


Fig. 20.—Low-voltage Distributor, 3-ph., 4-wire.

* ELEC. REV., May 23rd, 1924.

mains construction naturally varies according to circumstances: for instance, fig. 15 illustrates a straight-line tower and fig. 16 an angle tower of the 33-kV Ryeford-Gloucester transmission main; the 0.1 sq. in. (equivalent) steel-cored aluminium conductors are spaced 7 ft. 6 in. apart, the average span is 220 yards, the longest span 1,040 yards, the average height of tower 55 ft., the highest tower 115 ft., and the length of the line 30 miles.

A typical "A"-angle pole with a stay in the open country is shown in fig. 17, the "V" guards being visible; it is part of the Lydney-Chepstow 33-kV line, the 0.06 sq. in. stranded copper conductors being spaced 5 ft. apart with an average span of 90 yards and an average pole height of 36 ft. Fig. 18 indicates the special arrangement of the 0.06 sq. in. 33-kV conductors over a road at Sedbury, while fig. 19 depicts a typical 6,600-volt distribution feeder; the stranded 0.04 sq. in. copper conductors are spaced 3 ft. apart, the average span is 90 yards, and the average height of pole 36 ft. An example of the three-phase, four-wire, 0.0225 sq. in. l.p. network is reproduced in fig. 20, and fig. 21 shows the special towers that carry a three-phase, 0.1 sq. in., 6,600-V distributor over telephone lines and a main road between Drybrook and Mitcheldean. The lines are generally protected by an earthed steel wire slung beneath the conductors, and air-break switches are installed at appropriate points along the lines for isolating purposes and also to form tapping-off points.

A feature of particular interest is the utilisation of duplicate e.h.p. submarine cables to carry energy across the River Severn by the shortest route (see fig. 1) to serve the Stroud Valley. Navigation demands an overhead clearance of 250 ft. and the establishment of firm foundations in the shifting bed of the river for the construction of towers would have presented special difficulties; it was accordingly decided to cross under instead of over the river at a point where it is 1.25 miles wide. The laying of these cables* involved very elaborate precautions and preparation owing to the speed and variations in the direction of the tide: on occasions as many as four separate and distinct currents flow in different directions simultaneously, the ebb and flow being at the rate of 7 knots, and at the time the cables were laid the lift was 33 ft., the slack-water period at the change of tide being about five minutes only. The two 0.1 sq. in., three-core, 33-kV double-wire-armoured cables of 12 in. overall circumference were each laid in three lengths, necessitating four joints being made in mid stream, each joint involving over 30 hours' work. Under the circumstances, British Insulated Cables, Ltd., may justly be proud of the feat.

The West Gloucestershire Power Co., Ltd., has made supplies of electricity available in 21 parishes in its area, provides bulk supplies to the Stroud and Chepstow undertakings, and expects to commence selling energy in bulk to the Gloucester City Corporation this summer under a recently concluded agreement. During the year 1927 the undertaking generated 11,720,360 kWh, an increase of 17 per cent. on the previous year, while the energy sold amounted to 73.2 kWh per head of population served. In this connection the graphs reproduced in fig. 23, representative of the revenue and kWh sold in 1927, are of interest. The maximum load recorded was 3,500 kVA, and the load factor reached 40.5. Connections to the mains aggregated 8,014 kW, and 1,200 domestic consumers had installed 190 irons, 73 cookers, 2 washers, 286 heaters, 5 water heaters, 2 refrigerators, 30 vacuum cleaners, 85 kettles, 15 hot plates and grills, and 6 fans.

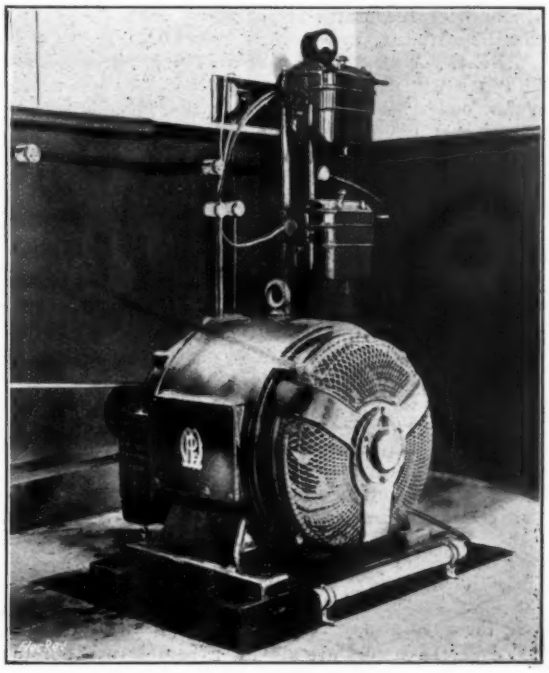


Fig. 22.—Motor with Tubular Heater.

The power factor of the system at the time of maximum load at the generating station is 98 per cent. and that of the industrial load over 90 per cent., which excellent results are attributed to the application of a kVA tariff: it tends to restrict the installation of larger apparatus than is really required, induces consumers to use the right type of motors, and encourages the application of static condensers for p.f. correction, it being claimed that the provision of such apparatus is economical even in the case of 5-h.p. installations. Although designedly somewhat complicated, the Company's tariffs result in an average residential rate of 2.2d. per kWh, all in; the average price paid for light is 7.05d. per kWh, and that for separately metered energy for heating and cooking purposes 1.57d. per kWh: so that the

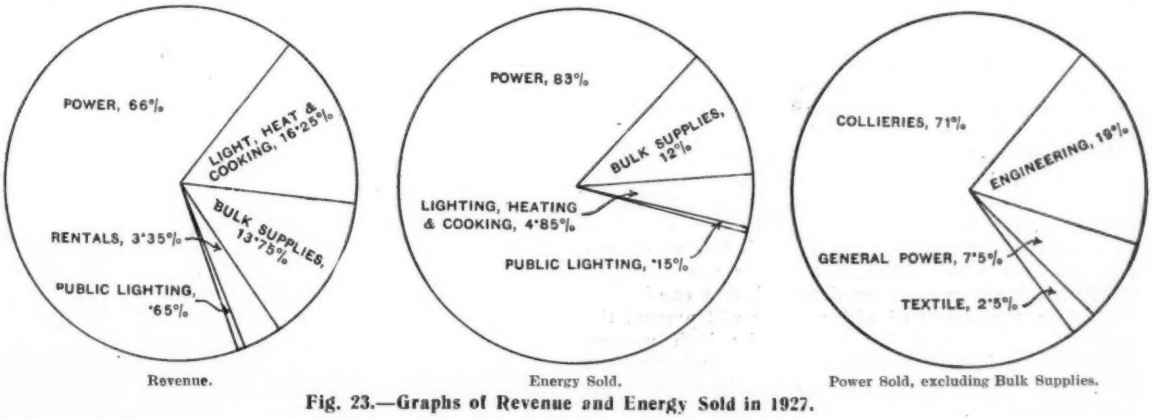



Fig. 23.—Graphs of Revenue and Energy Sold in 1927.

* See ELEC. REV., Feb. 1st, 1924, p. 172.

average price obtained for all l.p. energy is 3.8d. per kWh. The average cost per consumer's service, including meters, &c. is £10 18s., the average revenue obtained being £9 per consumer.

Mr. W. B. Packham, M.I.E.E., M.I.Mech.E., is station superintendent, and Mr. W. Hill, A.M.I.E.E., is in charge of the Mains Department. The Company's Sales Department, in charge of Mr. W. A. H. Parker, A.M.I.E.E., Assoc.A.I.E.E., is virile: while it does not sell apparatus, it maintains a domestic hire and repair service, operating in close co-operation with local contractors and availing itself in full of E.D.A. assistance.

As an instance of the manner in which consumers' requirements are carefully studied, reference may be made to fig. 22, which illustrates the arrangement of a 60-watt tubular heater in order to maintain the insulation resistance of a 15-h.p., two-speed motor installed in a damp situation which is infrequently run. The Sales Department is proud of its copious and detailed records; moreover, realising that their value depends on ready accessibility, the "Paramount" card-index costing and sorting system of the Copeland-Chatterson Co., Ltd., is made use of; the essence of simplicity, it enables, say, the number of electric irons in use in a particular area to be ascertained within a few minutes. Another device that has proved its utility is the "Maxigraph," made by Landis & Gyr, Ltd. These instruments record simultaneously the kVA demands of, for example, two consumers supplied by a single feeder, the charts enabling the maximum demand of one to be readily deducted from the total, thus facilitating metering problems and obviating the need for providing pilot cables and costing much less of course.

Such, in brief outline, are the methods and policy of the West Gloucestershire Power Co., Ltd., which seems to be determined to derive the maximum return from the £750,000 it has expended on its fast-growing undertaking.

# Tramcar Regenerative Braking.

**The author outlines the troubles experienced on tramcars with interpole motors, due to circulating currents between the motors, in the braking connection, and makes suggestions for preventing the failure of regenerated current and maintaining the retardation.**

By E. H. CROFT, A.M.Inst.C.E., A.M.I.E.E.

IN the present-day two-motor equipments for tramcars, the motors are almost invariably used for the purpose of braking the tramcar. This may be either pure rheostatic braking in which the generated current exerts a back tractive effort on the tramcar, or the generated current may also be used for operating solenoid brakes applied directly to the rails. In other cases, the solenoid brakes acting on the rails actually operate the wheel brakes by means of a mechanical contrivance. The system is well known and has been in use for many years, and is used both for emergency braking only, and also for service braking by a limited number of tramway organisations. In order to make the motors operate as generators, the following two forms of field connection are used:—"Bussed-field" connection and "crossed-field" connection. In the past it became almost universal to utilise the bussed-field method of connection in which a bus connection joins both motors together at the point where the field is connected to the armature.

In the case of crossed field, the current circulating through No. 1 armature energises No. 2 field. This method of connection has been extensively used on the Continent, and is now being adopted to some degree in England. From a theoretical aspect it has an advantage over the other method, but from a practical consideration it suffers from the drawback that one broken contact in the circuit of either motor will prevent the generation of current for braking by both motors. Furthermore, if one motor be cut out, the other cannot be made to generate without considerable complication in the controller.

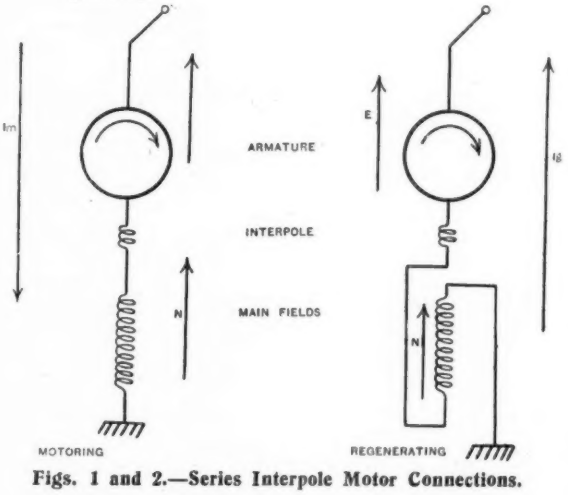
Almost all tramway undertakings have experienced, or come in contact with, cases where the retardation of the tramcar has been relatively extremely small, although the driver has had his controller on one of the strongest notches of brake. This is caused by the machines generating in series with their interpoles acting as main poles and creating what may easily be considered a "short-circuit" across the main poles. The result is that the braking is weak, and is not under any form of control.

If some of the accidents which have occurred are not actually due to this trouble, it is quite obvious that a serious accident might easily occur under such circumstances. In view of this, the writer has attempted to investigate the matter from a theoretical aspect in the hope that those more closely in touch with the actual running of tramcars may be able to confirm his theories.

In figs. 1 and 2 the connections for an ordinary series interpole motor are represented in a diagrammatic manner, showing clearly the relationship between current, rotation, e.m.f. and flux. If the action of a series motor be carefully considered with the aid of these diagrammatic representations, it will be seen that:

(*a*) Regardless of current direction or flux polarity, definite connections of armature to field are necessary for definite directions of rotation.

(*b*) For a given direction of rotation, the connections for motoring and generating will be reversed regardless of current direction or magnetic polarity.




**Figs. 1 and 2.—Series Interpole Motor Connections.**

It must be realised that interpoles not only partially neutralise the armature reaction, due to the concentration of the interpole flux, but also actually produce a commutating flux. Thus, apart from the concentration of the interpole ampere-turns, they are actually greater than the ampere-turns of the armature reaction. In fig. 3 the direction of e.m.f., flux, and current are repeated in diagrammatic form for a given machine when motoring in a clockwise direction with a current

of definite polarity. It is well known that before the introduction of interpoles dangerous circulating currents on tramcar equipments were unknown. It is

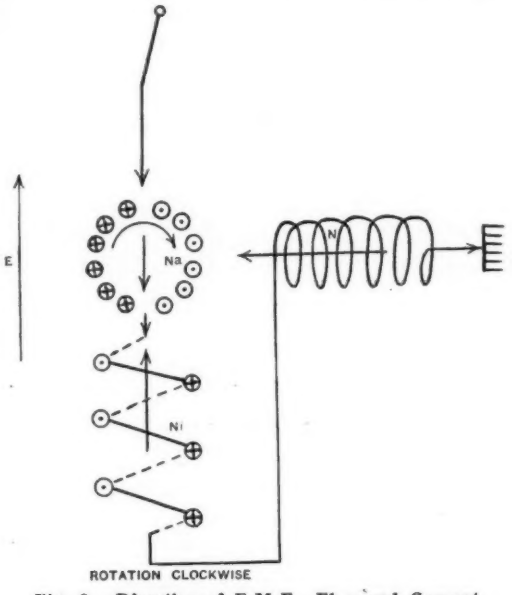



Fig. 3.—Direction of E.M.F., Flux and Current.

therefore to the action of the interpoles that one must look for the cause of the trouble. Let it now be assumed that the interpoles are rotated to a slight degree in a clockwise direction as indicated in fig. 4, which is drawn on similar lines to fig. 3, but with the interpole field distortion indicated. Such distortion can easily be produced in practice by slight manufacturing or maintenance defects. The residual field will remain with the same polarity as the motoring field, but the e.m.f. produced when generating will be in the same direction as when motoring. The current, therefore, produced by this residual field will be in the opposite direction to the motoring current indicated in fig. 3. There will thus be a flux produced by the interpoles which will more than neutralise the armature reaction. This flux is represented by the arrow NI. It will be seen from fig. 4

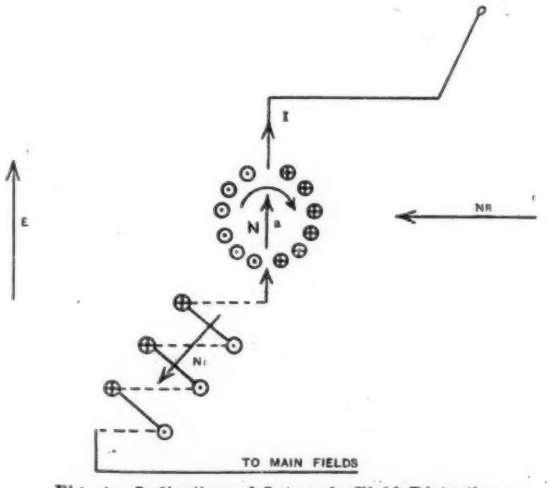
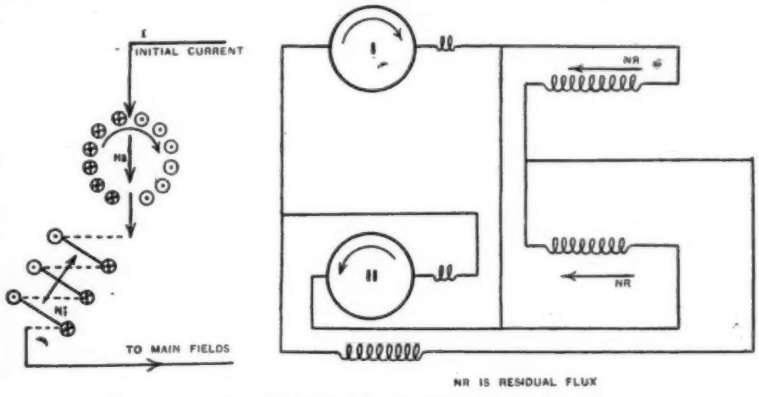



Fig. 4.—Indication of Interpole Field Distortion.

that this flux has a resolved portion in the direction of the residual field, and thus the machine will be capable of building up and running as a generator with the excitation obtained from the distorted interpole field. It follows from this that had the distortion of the interpole been in the anti-clockwise direction, when considering fig. 4, the action of the current produced by the residual field would have been to produce a flux in the interpoles which would have had a resolved portion neutralising the residual field, and the machine would consequently not have built up on its interpoles. Any generator requires a certain initiative for building up, and this is usually supplied in the form of the residual field. It may, however, be supplied by a small current being passed through the machine, and this condition is represented in fig. 5, in which similar interpole distortion to that of fig. 4 has been indicated. Such conditions often arise in practice when machines are in parallel and one builds up quickly, due to a much stronger residual field.

It will be seen in fig. 5 that the resultant interpole flux will create an e.m.f. which will increase the flow of current which is produced, and consequently the machine will build up. Similarly, had the displacement of the interpoles been anti-clockwise instead of clockwise, the machine would not have built up as a generator.

It follows immediately from the above reasoning that for the reverse direction of rotation, *i.e.*, anti-clockwise rotation, when considering figs. 4 and 5, the displacement of the interpole must be in the reverse direction for the machine to build up as a generator or to be incapable of building up as a generator. Thus, for a given direction of rotation, a machine will be liable to build up on its interpoles when the interpoles are distorted away from the neutral axis in a definite




Figs. 5 and 6.—Building-up Initiative Supplied by Current.

direction, regardless of whether the initiative for the building up be that of a residual field or a current flowing through the motor.

In the majority of tramcars two motors are used, and for a given direction of movement of the car the motors rotate in opposite directions. In the case of the few isolated four-motor equipments that exist, the same principles and difficulties are experienced, with the possibility of further complication. In fig. 6 the usual connections are indicated for a given direction of motion of the car. The various cases that can arise when both motors have interpoles distorted in a like direction and when both motors have interpoles distorted in different directions, are considered in the following:—

*Case 1.*—It is assumed that motor 1 interpoles are distorted so that the machine is capable of generating on its interpoles with the rotation indicated in fig. 6. It is also assumed that motor 2 has the same distortion of interpoles, which means that it will not be capable of generation on its interpoles for the same direction of car movement, *i.e.*, the opposite direction of motor rotation. Further, it is assumed that the residual field of motor 1 is much stronger than that of motor 2. A current will thus flow as indicated by arrow $I_1$ in fig. 7. Motor 2, due to very weak residual field, will have an e.m.f. of a very low value, and thus a current $I_2$ will pass as indicated by the arrow. A current will also pass in the

external circuit as indicated by $I_3$. Motor 2, however, is incapable of building up on its interpoles, and thus $I_3$ will still remain at a reasonable value, and the two motors will finally generate in parallel.

*Case II.*—The same conditions are taken as in case I, but with a different direction of car movement: $NR_1$ is still greater than $NR_2$. A current $I_1$, see fig. 8, due to No. 1 motor flux, will flow and divide, $I_2$ flowing as indicated in motor 2, and $I_3$ in the external circuit. Motor 2, however, is now capable of generating on the interpoles, thus $I_2$ increases and $I_3$ is reduced, reatively, ultimately resulting in an almost entire loss of voltage between points A and B, the available voltage between these points being dependent on the difference of characteristic of the two machines when generating on their interpoles. The action of motor 2 may be regarded as similar to that of a negative booster drawing the current away from the external circuit.

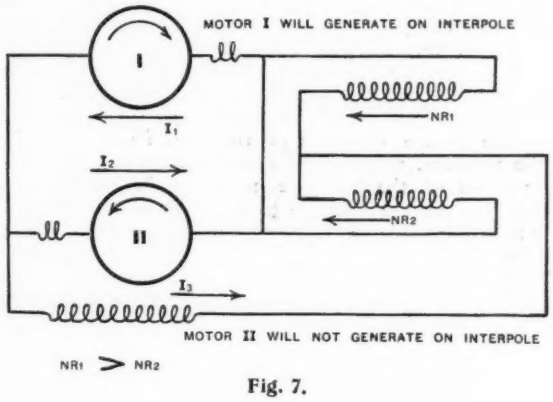



Fig. 7.

*Case III.*—Assume the conditions of case I, except that NR is now taken as greater than $NR_1$, and it will readily be seen that this will create exactly similar conditions to those of case II.

*Case IV.*—Again, with the conditions of case II, with the exception that $NR_2$ is considered greater than $NR_1$, conditions similar to those of case I will result.

*Case V.*—If there is distortion in different directions, so that for a given direction of movement of the car both motors are capable of generating on the interpoles, if one motor picks up quickly, a reverse current will pass through the other which will generate on the interpoles, resulting in conditions similar to case II; it is only necessary to consider one case of residual field being greater than the other as the arrangement is now symmetrical.

*Case VI.*—Assume conditions identical with those of case V, with the exception that a different direction of motion of the car is taken or, what is a similar condition, the same direction of car, but with both interpole distortions changed over, it will be readily realised that whichever motor has the stronger field, no building up on interpoles on the other motor will take place due to the reverse current passing through it, and thus the result will be similar to case I.

The consideration of the preceding cases shows that for a tramcar running in both directions, and with the present wiring systems, it is impossible to avoid the danger of the motors building up as generators on their interpoles and reducing the back tractive effort during braking to a very low value. The simplest way of overcoming this difficulty, from a theoretical standpoint, is to introduce a bus-bar between groups of motors from a point between the armature and the interpole of each machine. This, however, is not of much practical value, as it necessitates a further terminal on each motor and more contacts on the controller. Another method of overcoming the difficulty, which is very much simpler, is that of obtaining a flow of current through the main fields of one or more of the motors before connecting the armatures in circuit. It is believed that this method has recently been adopted by at least one well known tramway authority. It has the advantage that modifications to the controller are small and alterations to the motor are not required.

# Legal.

## Action Against Stepney Councillors.

AN ECHO OF THE GENERAL STRIKE.

AN interesting legal point arising out of the general strike of May, 1926, was raised in an action for damages brought before Mr. Justice Avory and a special jury on June 6th by Messrs. G. Scammell & Nephew, Ltd., engineers, Fashion Street, Spitalfields, against nine members of the Stepney Borough Council—Messrs. J. Hurley, C. R. Attlee, M. Aylward,

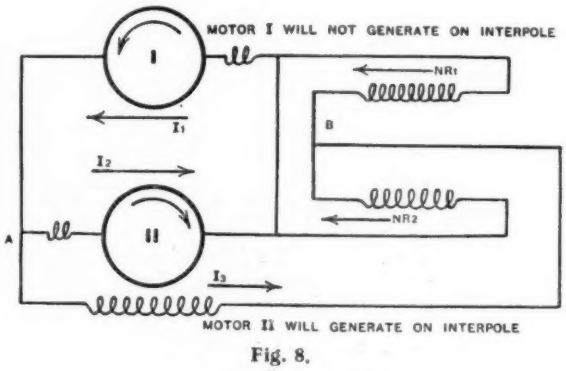



Fig. 8.

E. J. Bigden, G. Groves, H. Lazarus, J. Lewis, H. Oliver, and W. P. Parsons—and the allegation against them was that they conspired with certain members of the Electrical Trades Union to procure the members of the Electricity Committee of the Council to cut off plaintiffs' supply of electricity.

The allegation was denied, and defendants also pleaded that they had acted in accordance with their duties as councillors.

Sir WALTER GREAVES-LORD, K.C. (for plaintiffs) explained that the Stepney Council were the undertakers of the electricity supply for the district, and by statute there was an obligation upon them to supply electricity, with a penalty for default. Plaintiffs, who employed from 100 to 150 men, took their supply from the Council, but when the general strike occurred in May, 1926, their supply was cut off. The reason given by the Electricity Committee was that they had to maintain essential services and restrict the supply to other consumers. Plaintiffs' case, however, was that defendants agreed not to continue the supply because they did not desire that plaintiffs' business should go on. "If a man allows his political sympathies to interfere with the carrying out of his duty," said counsel, "that is no excuse before the law for doing that which is illegal."

Mr. W. L. MCCARTY, Town Clerk of Stepney, said that all the defendants had sympathies with the Labour Party. In his view serious rioting would have occurred if outside workmen had been called in for the power station.

On June 7th Sir WALTER GREAVES-LORD said it had been discovered that Messrs. Hurley and Oliver were not present at any material meeting of the Electricity Committee when the question of cutting off supplies was discussed. In the circumstances he had to consent to judgment with costs in favour of those two defendants. The parties had agreed upon a figure for damages if liability was proved against the other defendants.

Mr. J. A. LEE, a member of the staff of the Electricity Commission, said that full arrangements were made to meet the strike before it occurred and they would have been put into force at once if a request for assistance had been made. The Ministry of Transport was ready to provide staffs to run generating stations, but no application for assistance was received from Stepney. Mr. L. L. Robinson, borough electrical engineer, Hackney, said that they were able to continue to supply electricity to their consumers during the strike because as their own men left they were replaced by volunteers.

At the close of the plaintiffs' evidence Mr. JOWITT submitted that there was no case for the defendants to answer, and contended that the matter came within the Public Authorities Protection Act which stipulated *inter alia* that any proceedings brought upon a complaint against a public authority must be begun within six months of the Act complained of.

His LORDSHIP said he was not prepared to hold that there was no evidence that the defendants were not acting within the scope of the Act. He proposed to leave to the jury the question whether the defendants in doing what they did were acting *bona fide* in the execution of their duty, or whether they were acting from some improper and indirect motive such as the furtherance of a general strike.

Mr. W. A. JOWITT, K.C., for the defence, said that the question for the jury was whether the defendants as members of the Electricity Committee, in doing what they did to preserve the public lighting service in the borough during the strike and in stopping outside supply services, were acting honestly.

Mr. R. J. WOODHAMS said he was a member of the borough Council and the Electricity Committee at the time of the general strike. He was not a member of the Labour Party and was not in sympathy with the strike. The decisions of the Committee on the matters relevant to that action, said the witness, were not exactly unanimous, but no objection was raised to them by the minority party.

Major C. R. ATTLEE, M.P., barrister, said he was a member of the Simon Commission. He was opposed to the general strike as a weapon and had not advocated it in any way. At the meeting of the Electricity Committee—of which he was chairman—on May 3rd, 1926, they had a deputation from the Electrical Trades Union to inform them that their members in the Council's electricity works were going to stop work at midnight that night. He was apprehensive of very grave disorders. The question of introducing naval ratings to run the works was subsequently discussed. Witness said he had the opinion that such a step might have led to disturbances in a place like Stepney and also to the coming of armed forces and more trouble. Further, there was the possible damage to the electricity works if inexperienced people were brought in. Major Attlee said he endeavoured to persuade the E.T.U. deputation to provide a full supply of electricity for both light and power, but they refused. Eventually the Committee by a majority decided that it would be better to have the lighting even if they had to stop the supply of electricity for power. The members of the minority party did not protest against the decision. He declared that he acted throughout with the honest endeavour to carry out his duty. He agreed, in cross-examination, that Messrs. Scammell's fuses were withdrawn to prevent them from getting electricity for power. It was alleged that they were using the supply given for lighting for power at night. Major Attlee agreed that the effect of any agreement to withdraw electrical power from industry would assist the intention behind the general strike. To do that, however, was not the intention of the Committee. He considered that they were doing their best to maintain the public service.

On June 8th, at the conclusion of the evidence and the addresses of Counsel, Mr. Justice AVORY, in summing up the case for the jury, said he did not hesitate to express the opinion that all those people who organised the general strike were guilty at least of a criminal conspiracy, if not of something more serious. Any person who assisted or furthered the interest of those who organised and promoted a general strike were doing something illegal and the jury would have to decide whether the defendants acted in their honest belief that they were carrying out their statutory duty, or whether they were actuated by any indirect motive to injure the plaintiffs or to further the interests of the strikers. If they were really actuated by the desire to further the interest of the strikers they would not, in his opinion, be protected by the provisions of the Public Authorities Protection Act.

The jury found that the defendants were not acting in good faith and in the honest belief that they were carrying out their statutory duties; that they were actuated by an indirect motive to injure the plaintiffs and to further the interest of those taking part in the general strike.

His Lordship accordingly entered judgment for the plaintiffs for the agreed damages of £350, with costs.

A stay of execution was granted with a view to an appeal by the defendants.

### The Liverpool Electric Cable Co.'s Trade Mark.

MR. JUSTICE ROMER, in the Chancery Division, on June 5th and 6th, heard an appeal by the Liverpool Electric Cable Co., Ltd., from a decision of the Assistant Registrar of Trade Marks refusing to register the words "Liverpool Cables" as a mark distinguishing goods of the appellants' manufacture.

Sir DUNCAN KERLY, K.C., for the company, said that the mark had become distinctive of his clients' goods for the last two years. They were well-known manufacturers of electric cables, and had used the description "Liverpool Cables" since 1901. Their goods were sold all over the world, and there was no question that the words "Liverpool Cables" meant cables manufactured by the applicant company. No other company or traders dealt in goods under the description in question, and he asked that this be recognised by the registration of the two words as the applicant company's trade mark. The reason why the Assistant Registrar refused the application was, said counsel, that Liverpool was too big a town to have its name applied to one article of manufacture. He (counsel) cited a number of decisions to support his case, and pointed out that the names of towns had been registered as part of trade marks, for instance, "Helsby," in connection with a rival company's cables, was used as a trade mark. The company applied to register the mark in both "A" and "B" classes, in the latter case on the ground that it had become distinctive of the applicant company's goods over a period of two years.

Mr. STAFFORD CROSSMAN, representing the Assistant Registrar, said that the latter took the view that a town, when it became of sufficient importance, became more than a mere town name. It became part of the language, and if a person took the name of that town as a mark it was depriving other people of the use of it.

His LORDSHIP said that that must be the objection to any geographical names, and yet those names had been permitted. He did not see that the size of the town came into it.

Mr. CROSSMAN said that he did not see any reason for not using "London" if "Liverpool" was allowed. If somebody began to make cables at Liverpool to-morrow he could not call his cables "Liverpool" cables.

His LORDSHIP asked how he was to come to the conclusion that the words were not capable of distinguishing the company's goods when he had overwhelming evidence that they were.

Mr. CROSSMAN said it was true that there was evidence, but, on the other hand, there might be thousands of people who had never heard of "Liverpool Cables." The point on which the Assistant Registrar greatly relied was that the use of geographical names was liable to cause confusion.

His LORDSHIP, giving judgment, said there were two appeals, to register the words in classes "A" and "B" under the Acts of 1905 and 1919. The conclusion that he arrived at was that the words "Liverpool Cables" were now, and had for some time past been, capable of distinguishing the company's goods from those of the rest of the world. That being so, was it possible for the Court to say that the words were not "adopted to distinguish" the goods of the company, to use the words of the 1905 Act, or were "incapable of distinguishing" the goods, to use the words of the 1919 Act? In his opinion he could not come to such a conclusion. The Assistant Registrar said that the word "Liverpool" was incapable of distinguishing any particular person's goods, and also that it could not be registered as a mark because of the size of the place. But, his Lordship said, he failed to see what size had to do with it. No doubt there were some words which were incapable of distinguishing the goods of any particular person, such as "Sheffield" in connection with cutlery, "Burton" in connection with ale, and "Havana" in connection with cigars, but they had nothing to do with size. The word "Liverpool" had no special significance in connection with cables, and there was no evidence that anybody was likely to be led astray by the applicant company's use of the words "Liverpool Cables." His conclusion was that the Assistant Registrar's decision was erroneous, and the appeals should succeed in both classes. He added that he was not terrified at the suggestion that, on the granting of these appeals, he would be snowed under with applications to register the word "London" as a trade mark.

Mr. CROSSMAN said that in view of the importance of the case the Board of Trade might appeal.

### Injunction Against a Former Electrolux Employé.

ELECTROLUX, LTD., moved for an injunction before Mr. Justice Romer in the Chancery Division, on June 6th, restraining W. J. Harris from holding himself out as one of their district managers or as being in the company's employment.

Mr. HECKSHER, for the company, said that the defendant had been a sales manager, but was dismissed on April 30th under the terms of his agreement. He had since represented that he was still a district representative of the plaintiff company. An *ex parte* injunction was granted during the Whitsuntide vacation, and he (counsel) asked that it should be continued over June 12th, as there was a suggestion that the plaintiff company might re-engage the defendant under certain conditions.

His LORDSHIP assented to the course proposed.

### Daylight Signs Application.

IN the Patents Court on June 8th, the Assistant Comptroller (Mr. H. C. Haycraft) heard an application for a grant of letters patent in respect of daylight advertising signs and the like by Mr. V. Bridgman, Bayswater. The application was opposed by the A.B.C. Daylight and Electric Signs, Ltd., and other sign manufacturers, on the grounds of prior publication and insufficient subject-matter. Judgment was reserved.

### Sydney Bribery Charges.

Australian newspapers are now to hand giving reports of the commencement of the affairs which led up to the appointment of a Royal Commission to investigate charges of bribery against members of the former Sydney City Council and Mr. S. Y. Maling, deputy-manager of the Sydney Electricity Department. It appears that Mr. Maling applied for sick leave but was told by the City Commissioners that his presence was required in connection with an inquiry regarding power plant contracts. He went to New Zealand and was asked to return. Later the chief of the Criminal Investigation Department followed him to New Zealand and interviewed him. Mr. Maling then returned to Sydney, where he gave evidence before the Commission as we have reported.

# New Electrical Devices, Fittings, and Plant.

**Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.**

### "Chromalox" Electric Heating Units.

We learn from Messrs. GEO. BRAY & CO., LTD., Leeds, that they have purchased the patent rights for this and other countries for manufacturing "Chromalox" electric heating units. These are generally supplied in the form of rings or strips in a wide range of sizes to cover all domestic and industrial applications. The ring units can be used for the elements of such appliances as electric kettles, type-casting machines, crucibles, and so on, and the strip heaters are claimed to be excellent for the heating of isolated places in the home or factory. The apparatus is also made up in the form of

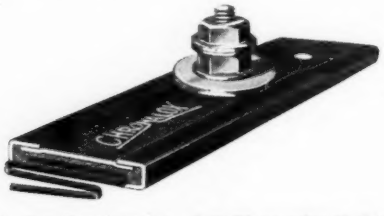


**Fig. 1.—Construction of "Chromalox" Strip.**

immersion heaters. Fig. 1 shows the construction of the units. The heating element is a nickel-chromium ribbon embedded in a refractory material which is entirely encased in rust-resisting iron, or in a high-temperature metal sheathing of rustless iron, nickel chromium or Monel metal for use under severe conditions. There are no open ends. The resistance wire is fixed to the special terminals under high pressure and without brazing.

### A Flexible Bolt.

An interesting development of Messrs. BRUNTONS, Wire Rope Works, Musselburgh, Scotland, is a flexible bolt which incorporates the makers' "Tru-Lay" rope and "Tru-Loc" fittings. One of its uses is depicted in fig. 2, and it will be seen that there are countless possibilities in this connection. It is fairly

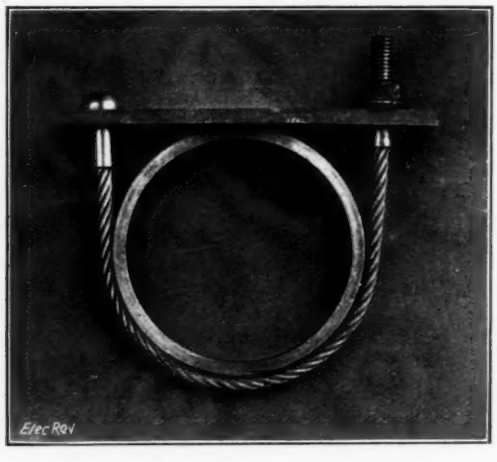


**Fig. 2.—Pipe Suspension by a Flexible Bolt.**

safe to say that the flexible devices could be used in all places where rigid "U" bolts are impracticable, and they should prove valuable for fixing piping of all descriptions and be particularly useful in connection with temporary work, especially for securing scaffolding and tackle.

### An Electric Soldering Iron.

The accompanying illustration, fig. 3, depicts the "Universal" model of a range of electric soldering irons which has recently been introduced by Messrs. KNOWLES & SON, 87, War-

**Fig. 3.—"Universal" Soldering Iron.**

dour Street, W.1. It has a consumption of 150 W and is supplied for various standard voltages from 50 to 250. It is about 15 in. long and weighs 1¼ lb. The screw-in bit is of hard-drawn copper with a flat soldering surface tapering from 1¼ to ¾ in. The shank is of mild drawn steel and the element container of brass. The iron is fitted with a 5-in. ash handle and the apparatus is supplied with 6 ft. of Maroon twin flex and a hard-wood b.c. adaptor.

### A New Vacuum Cleaner.

A new electric vacuum cleaner which has been introduced by Messrs. JOHN SHAW & SONS, WOLVERHAMPTON, LTD., Wolverhampton, is carried on two nickel-plated, rubber-tired wheels, and, it is claimed, readily responds to any movement. The dust bag is contained in a metal drum which constitutes the main body of the apparatus, special fasteners being provided to allow the bag to be easily taken out and replaced. The motor is suitable for either a.c. or d.c. and runs on ball bearings. It is mounted on special insulated fibre rings, which ensure noiseless running and at the same time insulate the motor from the case against "short-circuit."

### New Heavy-duty Switchgear.

A new type of heavy-duty switchgear which has been invented and patented by Mr. GEORGE E. WHITEHEAD, 102, St. Mary Street, Cardiff, is designed to overcome the disadvantages pertaining to the operation of the heavy circuit breaker bodily in the present designs of switchgear. The circuit breaker is permanently fixed in position and the coupling up and disconnecting to or from the bus-bars is effected by the simultaneous operation of moving-socket contacts between upper and lower fixed plug contacts. The moving contacts are carried by an isolating carriage which is operated by means of a hand-wheel. Fig. 4 shows a 3-phase unit designed for a normal loading of 300 A at 11,000 V, with a rupturing capacity of 250,000 kVA. The overall dimensions of the unit are: height, 7 ft. 6 in.; and floor space, 3 ft. by 2 ft. 9 in. The

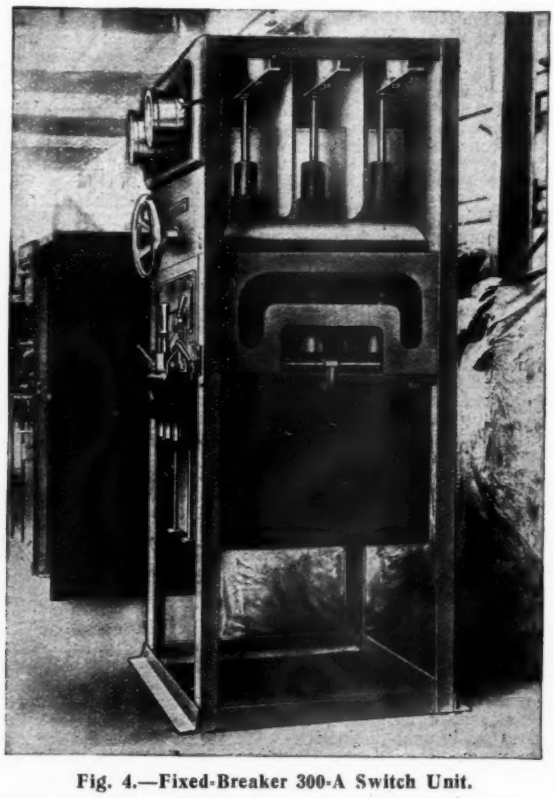


**Fig. 4.—Fixed-Breaker 300-A Switch Unit.**

circuit-breaker tank is interlocked with the isolating carriage so that the isolating contacts must be open before the tank can be removed. The circuit breaker itself is locked in position by means of catches carried on rods with padlocked handles. The following is a summary of the claims made for the new switchgear:—Minimum space required; weight of moving parts negligible; no racks, pinions, wire ropes, ratchets, motors, floor guide rails, or self-aligning accessories necessary; simple and complete protection for operator; no compound filling or oil insulation (other than in the circuit breaker); complete accessibility of all components, including transformers, fine wiring, cable tails, &c.; erection costs minimised; earthed, metal-clad and vermin proof; extensions and modifications exceedingly simple.

# Business and Industrial Notes.

**The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.**

### The E.D.A. Refrigeration Campaign.

On Thursday last week Sir John Gatti, President of the British Electrical Development Association, presided over the inaugural luncheon of the Refrigeration Campaign at the Hotel Cecil. The company present consisted of many well-known electrical men and a large number of newspaper representatives.

Sir John, in the course of a brief speech, said that reliance upon electricity was a phase of modern life. Under the Pure Food Act chemical preservatives in food were banned with a view to securing pure wholesome food for the people. Chemical preservatives as a remedy had proved rather worse than the evil they were intended to mitigate, but the prohibition of preservatives led to the difficulty of keeping food fresh. Preserved food might be unwholesome, but bad food must be worse. For some years refrigeration had enabled this country to draw on the reserves of the world for its food supplies. This refrigeration on a large scale, however, did not really help the immediate problem, which was to ensure the purity of food, not only in the hands of the wholesaler, or even the retailers, but when it had passed beyond them to the actual consumer. A great many up-to-date retailers had, of course, already established refrigeration as part of their business, but a great deal more could be done by the retail industry on these lines. It was, however, when we came to the actual consumer that we claimed we could do that which no other agency could perform. The electrical refrigerator disposed of the common objections to preserving food in a humid atmosphere—it was easy of installation, simple in working, and, as he could testify from personal experience, extraordinarily efficient in its action. Electricity suppliers would, he was sure, see that the cost of electricity for refrigerators was such that the running cost of an efficient electrical refrigerator would probably not exceed that of an ordinary ice-box.

Sir W. Arbuthnot-Lane spoke of the important position which women occupied in connection with such a subject as pure food and food preservation, and of the unwisdom of men over forty years of age consuming meat and other foods which were the cause of many common diseases. Mr. T. Hall, of Burton-on-Trent, the chairman of the E.D.A. Refrigeration Campaign Committee, followed with a few remarks, and at the close of the proceedings a range of British-made electrical refrigerators was on exhibition.

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The campaign was inaugurated in Birmingham on Friday last by a luncheon which was attended by the Lord Mayor (Ald. A. H. James). Mr. R. A. Chattock (city electrical engineer), who presided, said that the campaign had two objects—first, to assist the Government in its fight against impure food; and, secondly, to find additional work for electrical manufacturers, wiring contractors, and the industry generally. Refrigeration was going to save them from the slow poisoning which had apparently been going on owing to the use of chemical preservatives. Up to recently refrigerating apparatus had been very expensive, and had taken up a lot of room, but now that was all altered. Electrical refrigerators were being made in this country equal to any that came from abroad, and everybody could obtain one and adapt it to meet his requirements in the home or in the shop. Mr. R. E. England (British Association of Refrigeration) forecast the time when the refrigerator would be as essential a part of every house as the bath.

The *Yorkshire Post* reports that on June 7th Mr. C. J. Adshead, Leeds, addressed the West Hartlepool Circle of the E.D.A. on the subject of refrigerators. He stated that whereas in America 90 per cent. of the households possessed refrigerators, in this country the percentage was only 2½. Until recently refrigerators were very expensive, but as the result of intensive work by British manufacturers in the last three years, it had been possible to reduce the cost very considerably.

Activities were commenced in Bradford by a luncheon, on June 8th, at the Great Northern Victoria Hotel. Mr. Thomas Roles (city electrical engineer) presided, and he was supported by Ald. Wilfred Turner (chairman of the Bradford Electricity Committee), Mr. W. Dorman (chairman of the Ilkley Electricity), Ald. J. W. Longley (deputy-chairman of the Bradford Committee), Mr. H. Moss, organising secretary of the Bradford Circle, and other members of the electrical industry and leading citizens. Mr. Roles laid special stress on the importance of electrical refrigeration in the home in the interests of child welfare and in keeping food pure. Ald. Turner referred to the difficulties experienced by an island country like ours in getting foodstuffs from all parts of the world, and the great need of keeping pure and utilising all that was bought.

A representative gathering assembled at South Shields on June 7th, under the auspices of the E.D.A. At the preliminary luncheon the chair was occupied by Mr. James Edgar, manager of the South Shields Corporation Electricity Department and chairman of the local Circle. Mr. T. Taylor, Leeds, in the course of an instructive address, emphasised the fact that we imported beef, grain and fruit, &c., to the extent of about 60 per cent. of our requirements, and in the majority of cases these things had to be transported over vast distances and through varying climates. He then described several methods of preservation which had been tried with a varying degree of success, and suggested that electrical refrigerators were the real solution of the problem. Refrigeration had been developed to such an extent, he said, that it was now possible for every home to be equipped with the system.

### The E.D.A. Circle Campaign.

The British Electrical Development Association has published a report and summaries of general activities in connection with the Circle Campaign which was held from October to March last. In an introductory letter, Mr. A. C. Cramb (chairman of the Council) draws special attention to the immense amount of voluntary service on the part of all sections of the industry, and says that the results would not have been obtained without this assistance. Mr. Cramb also says that fifteen new Circles were formed, and the campaign was the means of promoting co-operative publicity effort throughout the country. The report sets out the *personnel* of the eight area sub-committees and a list of local Circles; the latter numbered 101 at the close of the campaign. Other lists show the newspapers and journals in which special advertisements appeared; the places, chairmen and speakers of the inaugural luncheons; combinations of local electrical interests producing composite newspaper advertising pages; undertakings which provided free electricity for window displays during National Electric Week; towns in which demonstration houses or exhibitions were organised; and towns in which lectures were delivered. Figures of the sales of the special publicity matter produced by the Association are given, and the following are included:—C.E.D.A.C. posters, 9,850; booklets, stamps, &c., 878,940; trade literature, 71,500; "Open Letter," 150,000; "C.E.D.A.C. Bulletin," 35,000; and National Electric Week window displays, 720. The number of electrical exhibitions, special demonstrations, &c., organised in connection with the campaign was 86, and there were 36 demonstration houses. The number of visitors to these is given as 1,200,000. There were 245 lecturers representing 98 towns, and 274 lecture engagements were reported to the Association. Between 300 and 400 Press articles, inspired by the National Electric Week, were collected by the Association.

### Hire-Purchase and Staple Industries.

In a recent article in the *Times Trade and Engineering Supplement*, a correspondent reflected upon the possible effects of the hire-purchase system, as applied to "luxury" items, upon the country's staple industries. It was pointed out that the anticipated increase in demand resulting from the system was largely limited by the fact that British industry worked largely for export, and export business could not suitably be conducted in that way. It was obvious, too, that no financial expedient of this sort could increase the nation's total purchasing power. In the United States the hire-purchase system was applied mainly to motor-cars, vacuum cleaners, gramophones, radio sets and furniture. Already the industries producing those commodities in this country were active, and although an increased demand for such articles would pass back some advantage to the depressed iron and steel, coal and textile industries, the effect would probably be slight and indirect in just those directions where British industry looked for improvement. Moreover, the increased consumption of that class of goods might conceivably produce economy and a falling-off in demand in the staple industries.

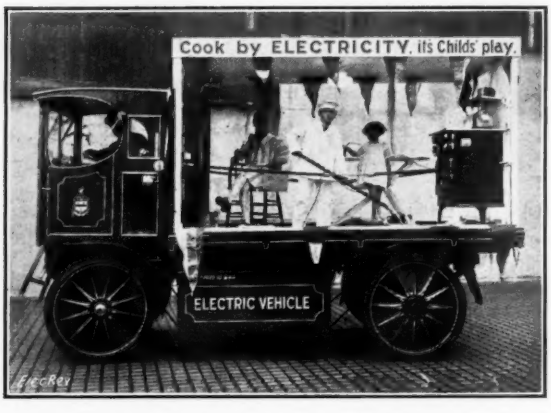
### The Timber Market.

Our Timber Trade Correspondent reports that the arrivals of new season's shipments from Northern Europe are on the small side, and this is likely to continue during the summer and autumn. United Kingdom buyers are cautious, conse-

quent upon the falling off in the demand, particularly as regards the building trade. Shippers are anxious concerning the maintenance of f.o.b. rates, considered to be too high by importers, and are arranging to restrict output; many Finnish mills are working short shifts and others have closed down, at least for a time. This is giving added strength to the spot market. Hard and choice fancy woods also are firm, with stocks light, but, on the other hand, American sawn wood varieties are weak, owing to large imports on a well-stocked market.

### A Blackburn Tableau.

In a recent carnival procession, in the cause of charity, the Blackburn Electricity Department had an effective tableau mounted on an electric vehicle representing an electric kitchen, which won the third prize out of a large number of entries,




**A Tableau by the Blackburn Electricity Department.**

and is illustrated herewith. It showed a little girl using an electric iron, another youngster busy with a vacuum cleaner, and the head of the household "taking things easy." The Edison Swan Electric Co., Ltd., entered a car representing its "Fullolite" lamp.

### Local Exhibition.

YORK.—During next week, which is Civic Week, a Trades and Industries Exhibition is being held in the Assembly Rooms and Festival Concert Rooms. Mr. A. W. House is making a special display of electrical labour-saving devices, shades and lamps designed and made in York, and domestic refrigerators. The York Electricity Department is showing electric lighting fittings, heating appliances, vacuum cleaners, irons, &c. Demonstrations are also being given of electric cooking. During the week the Foss Islands Road station and the Linton Lock hydro-electric station are to be open for inspection.

### The Marking of Imported Bearings.

The Standing Committee appointed by the Board of Trade under the Merchandise Marks Act, 1926, inquired last week into an application by ball and roller bearing manufacturers in this country for an Order-in-Council prohibiting the importation or sale in this country of imported ball and roller bearings unless they bear a mark of their foreign origin. The application related to complete bearings, as well as to parts of bearings, finished or unfinished, except the balls, rollers and cages.

The manufacturers responsible for the application were the Auto Machinery Co., Ltd., the Hoffman Mfg. Co., Ltd., the Ransome & Marles Bearing Co., Ltd., and Messrs. Rudge, Whitworth, Ltd. The application was opposed by Messrs. S. W. Lewis & Co., Ltd., of London, who import bearings from the Continent, and urged that a marking order was unnecessary, on the grounds that most foreign bearings were already marked, that British bearings were marked, and that the quantity of imports was negligible. The Skefko Ball Bearing Co., which, in addition to manufacturing in this country, imports from its factories abroad, was also represented, and raised one or two objections as to details of marking.

In the course of the proceedings, Mr. Faraday (counsel for the applicants) waived the application for the marking of the inner rings of complete bearings, but asked that when inner rings were imported separately they should be marked. The Skefko Co.'s representative (Mr. N. A. Cohen) intimated that that would satisfy his clients.

A further concession was made later in the proceedings, when a witness on behalf of the Skefko Co. pointed out that in the case of some bearings die stamping (as proposed by the applicants) might lead to cracking, and suggested that etching would be preferable to die stamping. In consequence of this the applicants said they would not object to etching instead of die stamping in the case of finished bearings, but urged that unfinished parts should be die-stamped. The Committee will report its conclusions in due course.

### Recent Contracts.

The Government of India has again accepted the tender of the Russa Engineering Works, Ltd., Calcutta, for the supply of "Verity" ceiling fans required during the next two years. The fans selected, after exhaustive tests, were the "Malabar" a.c. and "Ceylon 1928" d.c. patterns manufactured by Messrs. VERITYS, LTD., Aston. Substantial orders have already been received for both these types of fan, and it is anticipated that a very large number will ultimately be required.

Over 100 "Pul-syn-etic" electric clocks are being installed in the new station at Adelaide, Australia, including three large wall clocks on the platforms and 104 12-in. wall clocks for the offices, waiting rooms and general buildings. Four internally illustrated dials are also being erected in one of the towers. All of these are driven and controlled from a central master clock, which is to be automatically synchronised by a time signal from the local observatory. Messrs. GENT & Co., LTD., Leicester, are responsible for the design and manufacture of the entire installation.

The work in connection with the electrification of the Swansea to Mumbles Railway is now rapidly approaching completion. A train load of car trucks was recently dispatched from the Loughborough works of the BRUSH ELECTRICAL ENGINEERING CO., LTD. These trucks are for the eleven double-decked covered-top cars which this company has constructed. The cars, which each have seating accommodation for 106 passengers, are claimed to be the largest vehicles of the tramcar type constructed for service in this country. The trucks are of the equal wheel bogie type, and are of special design, in order to keep the floor level of the car not more than 2 ft. 4 in. from rail level. The wheels are 26 in. diameter, and are provided with 5-in. tires for running on main live rails.

### New Catalogues and Lists.

MESSRS. DAVIS & TIMMINS, LTD., Brook Road, Wood Green, N.22.—A full price-list of brass and steel screws.

MESSRS. T. HARDING CHURTON & CO., LTD., Atlas Works, Water Lane, Leeds.—Descriptive List No. 706, containing illustrated specifications of single-, two- and three-phase induction motors.

MESSRS. HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—A priced and illustrated catalogue of "Wigan" prismatic bulkhead lighting fittings.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—An illustrated folder giving particulars and prices of the company's radio h.t. supply units for a.c. or d.c. mains.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Pamphlet No. 241, describing the company's land-station transmitters (Types T.2, T.1, and T.A.1); Leaflet No. 1077, dealing with the Marconi single- or multi-way directional receiver (Type R.g.14); and Leaflet No. 1082, containing details of a 100-W fixed-wavelength telephone set (Type X.M.B.1). Fully illustrated.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—Publication No. 199, describing the company's service to buyers and users of its motors.

THE LONDON ELECTRIC FIRM, Brighton Road, South Croydon.—A set of illustrated pamphlets dealing with the company's numerous activities. They include particulars of searchlights, suspension lighting, worm reduction gear, soldering irons, and domestic apparatus.

The REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, Staffs.—An illustrated and priced leaflet advertising the "Revolian" cabinet-cone loud speaker.

MESSRS. PARMITER, HOPE & SUGDEN, LTD., Vernon Street, Longsight, Manchester.—A catalogue (52 pp.) containing illustrated particulars of "Aeroflex Fluvent" ironclad distribution boards and switch fuses for power and lighting. Priced.

MESSRS. SINCLAIR, PAGET & CO., LTD., New Inn Yard, Shoreditch, E.C.2.—Price lists of battery-charging and control switchboards.

THE MACINTOSH CABLE CO., LTD., St. James's House, St. James's Street, S.W.1.—Publication H.S.C. 11, describing, with illustrations, the company's moulded-case house-service cut-outs.

EBONESTOS INSULATORS, LTD., Excelsior Works, Rollins Street, Canterbury Road, S.E.15.—A June-July calendar and blotter advertising the company's products.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram-G.E.C. Bulletin" for June, in which appear profusely-illustrated articles and notes on "Osram" lighting installations, a new "Magnet" cooker, the company's radio sets and accessories, and other matters.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-111, New Oxford Street, W.C.1.—June stock list of motors, dynamos, &c.

MESSRS. J. F. RATCLIFFE, LTD., New Summer Street, Birmingham.—An illustrated brochure dealing with the company's production of rolled metals.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—A very attractive window screen advertising the company's cone loud speakers. The subject is a pastoral one treated in colours.

ASCOG, LTD., 44, Theobalds Road, W.C.1.—Four illustrated pamphlets, dealing, respectively, with "Atrax" lighting units,

advertising signs, the "Atrax Phantascope" and flashing lamps. Priced.

THE SUN ELECTRICAL CO., LTD., 118-120 Charing Cross Road, W.C.2.—Illustrated and priced leaflets describing two new water boilers and the "Premier Junior" vacuum cleaner.

THE CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—A folder illustrating several examples of heating and ventilating installations in which the company's instruments are employed for regulation and control.

THE WILKINSON ELECTRICAL EQUIPMENT CO., Fahy's Buildings, Euston Road, Morecambe.—A leaflet illustrating and briefly describing the company's star-delta motor starter with no-volt release.

SADIA, LTD., 22, Newman Street, Oxford Street, W.1.—List H.S., containing illustrations, particulars and prices of the company's electric water heaters.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—June stock list of motors and dynamos.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—A profusely-illustrated brochure dealing with the electrical control of textile machinery, and showing many applications of the company's controlling apparatus.

M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.—An illustrated price-list of all-insulated and metal switch-plates; and a leaflet illustrating the company's special socket and pin.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A 164-page catalogue of electric lighting equipment for commercial and industrial applications. A large number of patterns and designs are illustrated, and prices are given in each case. The book is well produced and of a convenient size.

### Bankruptcy Proceedings.

P. W. PENTY (Sackville Electrical Co.), 38, Mannville Terrace, Morley Street, Bradford.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released June 19th.

A. E. CROSS, electrical engineer, 8, Cooksley Road, Redfield, Bristol.—First meeting held June 13th, at the Official Receiver's office, 26, Baldwin Street, Bristol. Public examination July 6th, at the Guildhall, Bristol.

W. A. HAMMOND, wireless dealer, 31, Middle Street South, Great Driffield.—First meeting held June 14th, at the Official Receiver's office, 37, Scale Lane, Hull. Public examination, June 25th, at the Guildhall, Hull.

J. A. H. HOLLIDAY, electrical engineer, 38B, Worthington Street, City Road, Bradford.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released May 29th.

N. H. PAYNE, electrical engineer and wireless dealer, 11, Queen Street, Dawlish.—Trustee, Mr. W. R. Cocks, Official Receiver, Exeter Bank Chambers, 67, High Street, Exeter, released May 23rd.

W. M. HORSFALL, 7, Redcross Street, Liverpool, electrical engineer.—Last day for proofs for dividend June 23rd. Trustee: Mr. E. D. Symond, Official Receiver, Government Buildings, Victoria Street, Liverpool.

A. M. WILLMORE, 45, King Street, Brighton, electrical and radio engineer.—Trustee, Mr. G. H. Acheson, Official Receiver, 12a, Marlborough Place, Brighton, released May 31st.

P. F. BRITTAIN, 118, Cannon Street, E.C.4, electrical engineer.—Last day for proofs for dividend, June 22nd. Trustee: Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2.

J. SPAVEN, 51, George Street, Bradford, electrical and mechanical engineer.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released May 31st.

H. WILSON (deceased), late 56, Woodhall Avenue, Thornbury, Bradford, electrical contractor.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released May 31st.

C. H. DAVIES, 6, Stamford Arcade, Ashton-under-Lyne, electrical engineer and contractor, &c.—Receiving order made June 5th, on debtor's own petition.

H. J. HODDINOTT (trading as Hoddinot & Co.), Cathedral Yard, Manchester, electrical fittings supplier.—First meeting June 18th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination July 6th, at the Court House, Quay Street, Manchester.

### Company Liquidations.

CECIL HODGES & CO., LTD., electrical engineers, Empire Works, Horley, Surrey.—The statutory first meetings of the creditors and shareholders of this company were held on June 7th, at Carey Street, W.C., before Mr. E. T. A. Phillips, Official Receiver. A statement of affairs was submitted showing unsecured debts of £16,503; fully secured debts of £101; preferential claims, £311; and loans on debenture bonds, £8,403; making a total indebtedness of £25,319; assets valued at £11,236; a deficiency of £13,981 in assets to meet liabilities; and a total deficiency of £28,481 with regard to contributories, the issued capital being £15,000. The chairman reported that the company was incorporated in 1910, with a nominal capital of £10,000, subsequently increased to £15,000, for the purpose of acquiring as a going concern the business of electrical engineers which had been carried on by Herbert C. Hodges for about 20 years previously. The purchase consideration for the goodwill of the business was agreed at £998, and was satisfied by the allotment of shares. H. C. Hodges was, on January 12th, 1911, appointed managing director at £300, subsequently increased to £1,000 per annum. In April, 1926, H. H. Hodges, who had been for some years employed by the company as a salesman, was appointed a director at a salary of £800, increased in 1927 to £1,000 per annum, plus £5 per week expenses. H. L. Baynham (a director) was appointed salesman in January, 1927, at a salary of £260 per annum, plus commission (a minimum remuneration of £750 being guaranteed for the first year) and £5 per week expenses.

Dividends were declared in 1911, 1912, 1913, 1914 and 1921, and the trading accounts after that period showed a loss of £194 in 1922; and one of £530 in 1923; net profits of £137 and £296 in 1924 and 1925, respectively; a loss of £6 in 1926, and a loss of £14,721 in 1927. In February, 1925, H. C. Hodges reported to the directors on the business done by the company during 1924, and stated that the turnover was rapidly increasing and profits being maintained. After discussion it was resolved, in view of the satisfactory progress of the company, to increase H. C. Hodges' remuneration to £1,500 per annum, being £1,000 salary as managing director and £500 as chairman of the company. On June 17th, 1925, it was resolved to mortgage the company's leasehold premises at Dalston Lane for the purpose of obtaining the necessary capital to cope with the increasing business of the company, and the bankers granted an overdraft up to £1,500 on the security of a debenture. In the following September the bank agreed to increase the overdraft to £3,500 upon the joint and several guarantees of the directors. Early in 1926 endeavours were made to find works larger than those at Dalston Lane, but without success, and in April, 1927, it was decided to purchase the freehold of a plot of land at Horley for £1,200, and to erect works at a cost of £7,160. In October, 1927, the bank agreed to allow the overdraft to be increased to £6,500, on the guarantees of four directors. On January 9th, 1928, a 7½ per cent. second mortgage debenture was issued to secure an advance of £2,000, but it would be the duty of the liquidator to consider whether that bond was valid, as the winding-up petition was presented on March 21st, 1928. In January the builders of the works at Horley obtained judgment for a balance of £1,500 due under the contract: following that step the bank demanded the repayment of £7,403, and appointed a receiver and manager. Since the receiver was appointed he had been carrying on the business of the company in order to complete the orders in hand, and at the same time had endeavoured to dispose of the business as a going concern, but no sale had yet resulted. The amount of dividend, if any, solely depended on the amount realised for the Horley works. The failure of the company was attributed by H. C. Hodges to the building of a new factory with insufficient capital at the disposal of the company and the large falling off of orders in 1927. Another director (F. Atkinson) attributed it to the increase in the company's salary bill in anticipation of increased business at the new works, and the falling off in the company's turnover in 1927, largely due to the coal and general strikes of 1926.

A resolution was passed for Mr. W. A. J. Osborne to act as liquidator, assisted by a committee of inspection, consisting of representatives of Messrs. Wilmer & Sons, Ltd., J. Jarvis and Sons, Ltd., Chloride Electrical Storage Co., Ltd., and Burton, Delingpole & Co., Ltd., and Mr. H. L. Baynham.

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WATERHOUSES (ELECTRICIANS), LTD., electrical and wireless engineers, Castleford.—A meeting of creditors was held recently at Castleford. Mr. F. W. Hanson, the liquidator, submitted a statement of affairs which showed liabilities of £693 and net assets of £314, leaving a deficiency of £379, so far as the creditors were concerned. As regarded the shareholders, there was a deficiency of £860. The company was registered in March, 1924, with a nominal capital of £500. During the year to March, 1925, a net profit was earned, and a dividend paid on the preference shares. In the following year the turnover was £1,820, but there was a net loss of £361. In the succeeding 12 months the sales fell to £1,405, with a net loss of £372. During the past year the turnover had increased to £1,890, with a net profit of £10. The present position was attributed to lack of capital, loss on electrical contracts, industrial troubles and bad debts. A resolution was passed confirming the voluntary liquidation of the company with the present liquidator, who stated that he would endeavour to dispose of the business as a going concern. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Carr & Child, Ltd. ... | 72 | Ray U.V. Co. ... ... ... | 33 |
| Dyson, J., & Co., Ltd. ... | 53 | Edison Swan Electric Co., Ltd. ... ... ... ... | 22 |
| Hardman & Co., Ltd. ... | 51 | Woodhead, G. E. ... ... | 21 |
| Albion Electrical Stores ... | 40 | | |
| Fox, E., Ltd. ... ... ... | 39 | | |

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A. C. ALEXANDRA & CO., LTD.—Mr. G. D. Pepys, Senior Official Receiver and Liquidator, states that he is applying for his release as liquidator of this company. He reports that the values placed upon the assets were excessive; the alleged debt for unpaid calls was repudiated; and most of the book debts had been collected before liquidation. The preferential creditors were considerably under-estimated. Mr. A. C. Alexandra, the managing director, made a voluntary contribution of £466 towards the liabilities and expenses. The preferential creditors have received dividends amounting to 12s. 11½d. in the £, and there appears to be no prospect of a further dividend.

ELECTRIC PRODUCTIONS CO., LTD., late of 32, King Street, W., electrical engineers.—A further meeting of the creditors in this matter was held on June 4th, at the offices of Messrs. Leonard, Dickinson & Co., 82, Victoria Street, S.W.1, when Mr. Hart, one of the directors of the concern, said that he was prepared to make an offer to the creditors to buy their claims for the sum of 10s. in the £. The creditors considered that that offer should be increased, and later he agreed to pay the sum of 15s. in the £. The creditors present resolved to confirm the appointment of Mr. Dickinson as liquidator.

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NEW SHIPSTON LIGHTING CO., LTD.—Winding up voluntarily. Liquidator, Mr. F. B. Hancock, solicitor, Shipston-on-Stour. A meeting of creditors was held at the offices of the liquidator, Mr. F. B. Hancock, Shipston-on-Stour, on June 12th. The proceedings were formal; all creditors have been, or will be, paid in full.

WALLIS & WATSON, LTD.—Particulars of claims by July 2nd to the joint liquidators, Mr. J. W. Hirst, 29, East Parade, Leeds, and Mr. C. H. Baker, Standard Buildings, City Square, Leeds.

BOLLING & LOWE, LTD.—A meeting of members is called for July 6th, at 16-17, South Street, E.C., to hear an account of the winding up from the liquidator, Mr. J. A. Campbell.

R.M.P., LTD.—A meeting of members is called for July 6th, at Midland Chambers, Warwick Passage, Corporation Street, Birmingham, to hear an account of the winding up of the company from the liquidator, Mr. N. A. Denson.

METROPOLITAN ELECTRIC WIRE CO., LTD.—First and final dividend of 2s. 5½d. in the £, payable June 8th, at the office of the Official Receiver and Liquidator, 33, Carey Street, W.C.2.

### Private Arrangements.

C. W. DAVIES, 1a, Stanwell Road, Penarth, Glam., radio engineer and electrical contractor.—A meeting of creditors was held on June 4th at the Palatine Trade Protection Office, Kimberley House, Holborn Viaduct, E.C. Mr. P. S. Booth submitted a statement of affairs which showed ranking liabilities of £1,306 and net assets of £1,136, leaving a deficiency of £170. Mr. Booth said that the assets had been valued on the basis of a going concern, and at a forced realisation the stock would not produce anything like the figure given in the statement. The debtor commenced business in Penarth in 1922, and acquired his present premises in 1924. At the outset he had a capital of about £200, of which £112 was lent by his wife. During the year to March, 1925, the sales were £2,559, with a net profit of £87. In the following year the sales increased to £2,731, with a net profit of £76, and in the succeeding 12 months the sales dropped to £2,437, and the net profit went down to £19. During the year to March last the sales were £2,847, with a gross profit of £447, but after allowing for all the expenses, there was a net loss of £5. The debtor was in receipt of a pension, which had been paid into the business, and his drawings had been small. Proper books had been kept, and balance sheets regularly prepared. The present position was attributed to insufficient business and severe competition. It was suggested that the business should be continued for the time being with a view to its sale as a going concern. A resolution was passed in favour of the matter being dealt with under a deed of assignment with Mr. Booth as liquidator, together with a committee consisting of the representatives of Messrs. Brown Bros., Houghton-Butcher (Gt. Britain), Ltd., and A. J. Dew & Co. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Brandes, Ltd. ... ... | 25 | Dew, A. J., & Co. ... ... | 55 |
| British Radio Corpn., Ltd. | 32 | Houghton-Butcher (Gt. Britain), Ltd. ... ... | 40 |
| Brown Bros., Ltd. ... ... | 86 | Holdgate & Commin, Ltd. | 31 |
| Callender's Cable & Construction Co., Ltd. ... | 58 | M.P.A. Wireless, Ltd. ... | 32 |
| Cryselco, Ltd. ... ... | 22 | Marconiphone Co., Ltd. ... | 30 |
| Capels Wholesale Wireless Co., Ltd. ... ... ... | 37 | Sadler Bros., Ltd. ... ... | 29 |

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ELECTROLINES, LTD., electrical and wireless dealers, Denmark Street, Bristol.—A conference of creditors was held recently, when a statement of affairs was submitted showing liabilities of £1,113, and net assets of £196, leaving a deficiency, so far as the creditors were concerned, of £927. The company was registered in 1925 with a nominal capital of £1,000, and shares to the extent of £150 were allotted for cash. At the time of the formation a debenture for £450 was issued. The deficiency in the statement of affairs was attributed to losses on trading, together with the writing down of the assets. An offer was made of a composition of 4s. in the £, which it was decided should be accepted. The creditors include:—

| | £ | | £ |
|---|---|---|---|
| Simpson, Baker & Co. | 280 | Coward, F. O. ... ... | 75 |
| Bristol Wireless Co. ... | 110 | Burris, F., & Sons ... | 65 |

### Proposed Argentine Cold Storage Plant.

The *Review of the River Plate* states that the Compañia Anglo-Argentina de Electricidad which provides electric light and power to the town of Mercedes (Province of Buenos Aires) is contemplating the construction of a cold storage installation to serve local requirements. During 1927 an average of 1,287 animals were slaughtered monthly within the municipality alone. The town's milk consumption is 12,000 litres per day.

### Trade Announcements.

Messrs. H. A. MOORE & Co., LTD., 150, Southampton Row, W.C.1, have been appointed sole agents for London, Southern Counties and South Wales for all products of the Arora Co., Loughborough. They have also acquired the sole agency for Great Britain for the Fitzgerald Manufacturing Co., the Yale Electric Corporation, and the Superior Electric Products Co. Messrs. Moore have extended their wholesale electrical showrooms at 150, Southampton Row.

The LONDON ELECTRIC WIRE CO. & SMITHS, LTD., is removing its sales, orders and accounts departments on June 16th from Playhouse Yard to larger offices at Church Road, Leyton, E.10. The telegraphic address of the new offices will be "Lewcos Phone London," and the telephone number "Walthamstow 2531."

The SCOTTISH BOILER & GENERAL INSURANCE CO., LTD., has removed from Lloyd Street, Manchester, to Yorkshire House, 45, Cross Street, Manchester.

The new branch of the GENERAL ELECTRIC CO., LTD., Magnet House, 175, Union Street, Plymouth, is now nearing completion. The trade counter and dispatch stores were to be opened on June 11th, and it is hoped that the showrooms will be opened to the public by the end of the month. The General Electric Co., Ltd., has also opened a new branch at Middlesbrough, under the management of Mr. W. Griffiths.

The MACINTOSH CABLE CO., LTD., announces the opening of a new stores at Plymouth. Stocks of cables and accessories are now held c/o the Dunlop Rubber Co., Ltd., 14-17, Manor Road, Plymouth. Telephone: 2846/7; telegrams: "Dunlop, Plymouth."

The MIDLAND ELECTRIC POWER INSTALLATION CO., Wolverhampton, announces that its works will be closed to-morrow (Saturday) on the occasion of the firm's annual outing.

R. I. & VARLEY, LTD., has appointed Mr. H. C. Saxby, 92, Barrington Road, Brixton, S.W.9, as representative for the Home and South-Eastern Counties, as from June 1st.

ASTER, LTD., has been re-established to take over the whole of the conduct of that portion of the business now undertaken by Arrol-Johnston & Aster Engineering Co., Ltd., consisting of the manufacture and supply of electric generating, country house lighting, pumping and compressor sets, with paraffin engines, under the supervision of Messrs. Sydney D. Begbie and Charles H. Barrett. The company's offices are at Cecil Chambers, 86, Strand, W.C.2.

We have received from the INDEMNITY SERVICE, LTD., 65, London Wall, E.C.2, a pamphlet setting out its functions, which include the financing of all kinds of operations relating to long-credit terms and deferred payments.

Messrs. GREENWOOD & BATLEY, LTD., state that the selling organisation for their "Greenbat" industrial electric trucks, tractors and locomotives, recently in the hands of Messrs. W. Goodyear & Sons, Ltd., Dudley, is now being handled entirely by themselves, and they are no longer associated in any way with the Dudley company.

### Dissolutions of Partnership.

HAVIL MOTOR CO., automobile, electrical, and radio engineers, &c., 30, High Street, and Havil Street, Peckham.—Mr. W. H. Butcher, Mr. G. P. Hall, Mr. J. A. Phillips, and Mr. E. S. Smart have dissolved partnership. Messrs. Butcher, Hall and Phillips will attend to debts and continue the business.

HORTON & MARCHANT, wireless and electrical engineers, &c., 9, South Street, West Tarring, Worthing.—Mr. G. A. Horton and Mr. C. H. Marchant have dissolved partnership. Mr. Marchant will attend to debts, and continue the business under the same style.

### Book Notices.

"Naval Electrical Manual," 1928, Vol. I, by Prof. C. L. Fortescue. Pp. xii+812. Illustrated. London: His Majesty's Stationery Office. Price 12s. 6d. net.

"Your Car—How it Works." By A. G. D. Clease, B.Sc. Pp. 52; 94 figs. London: Iliffe & Sons, Ltd. Price 1s. net.

### For Sale.

Edinburgh Corporation Electricity Supply Department invites offers for 20 tons of scrap copper wire from supply cables. Salford Electricity Department has for disposal one 500-kW rotary convertor, transformer, and starting panel. (See our advertisement pages to-day.)

### The Cardiff Engineering Exhibition.

The seventh of the series of annual exhibitions organised at Cardiff by the South Wales Institute of Engineers is to be held from November 21st to December 1st. The exhibition will be divided into eight sections, including an electrical section. Applications for space must be received by the organisers by August 31st. Further particulars of the show appear in our advertisement pages to-day.

### Coventry and the Sale of Fittings.

The Coventry Electricity Committee having considered a proposal for the setting up of a department for the supplying of electrical fittings, &c., for retail sale, has reported against it, on the ground that, having regard to the heavy financial commitments of the electricity undertaking, the time was inopportune. The Labour group of members of the City Council made a strong protest against this decision, but their attempt to have the proposal reconsidered was heavily defeated.

### The Marking of Imported Pumps.

The Standing Committee (General Merchandise) appointed by the Board of Trade will hold an inquiry as to whether pumps of all descriptions and parts thereof should bear an indication of origin on July 9th and 10th. The inquiry will be held at the Board of Trade Offices, Great George Street, S.W.1, and communications should be addressed to the secretary at that address.

### New Belgian Company.

A new electrical financing undertaking, known as the Electro Trust, has recently been formed in Brussels, with a capital of 302,500,000 fr. (about £1,160,000), the object being mainly to secure a participation in electricity supply undertakings in the Dutch East Indies. At present power supply is practically confined to Java. It is considered that there is room for a great extension, particularly in view of the fact that ample water power is available. As part of its activities the Electro Trust has secured a financial interest in the Nederlandsch-Indische Waterkracht Exploitatie, which was formed in 1925 under the auspices of the Dutch East Indies Government. The purpose of the company is to establish a hydro-electric station to utilise the power of the Kali-Konto falls. Work on the plant, which will have an initial capacity of 24,000 h.p., is well in hand.

### Wages in the Engineering Industry.

According to *The Times* the Executive Committee of the General and Municipal Workers' Union has reached the conclusion that national applications for higher wages in the engineering industry should be abandoned in favour of localised applications. The Committee states that wages appear to be regulated in accordance with conditions in the least prosperous sections of the industry. Its view is "that the depression of trade in such sections should not preclude the possibility of securing an advance in wages for those sections (such as the motor and electrical) which are in a highly prosperous and profitable condition." The executive has decided to send a *questionnaire* to the districts asking for their opinions respecting a proposal to promote an application for an advance in wages in the motor section (and/or other prosperous sections of the engineering industry).

### Hungarian Electrical Production.

The May *Review* of the Anglo-International Bank, Ltd., states that the production of electrical machinery in Hungary during 1927 was valued at 54,950,000 pengoes (£1,960,000), as compared with 47,760,000 pengoes (£1,700,000) in 1926.

### Canada's Overseas Trade.

Speaking before the annual convention of the Canadian Manufacturers' Association at Quebec last week, Mr. James Malcolm, Minister of Trade and Commerce, said that the Canadian Government proposed to appoint a number of additional trade commissioners to countries where Canada was not now represented. The Government also intended to subsidise further steamship services carrying Canadian exports to every country of the world.—*Reuter* (Quebec).

### European Electrical Expenditure.

Figures prepared by the United States Department of Commerce of the annual *per capita* expenditure in European countries upon electrical goods, generally in 1925, show that Germany led in this respect with a figure of $6.72. Great Britain was second in the list with $6.26. Switzerland was credited with $4.90, and Austria with $3.48. Russia ($0.14) was at the foot of the list.

### British Trade Delegation to Finland.

Under the auspices of the London Chamber of Commerce, a party of British manufacturers and traders is to visit Finland to investigate the possibilities of trade with that country. The leader will be Mr. C. Gane, chairman of the Anglo-Finnish Section of the Chamber, and the delegation will include representatives of the engineering industry (including electrical engineering).

### The Imports of Paraguay.

In the trade returns compiled by the Uruguayan authorities electrical goods are not separately distinguished. From the *Board of Trade Journal*, however, it is seen that the imports of "Apparatus and machinery and their accessories, and electrical goods" rose in value from £117,979 in 1926 to £132,779 in 1927.

### Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during April last were valued at £32,353, bringing up the total for the first four months of the year to £151,600, as compared with £131,803 in the corresponding period of 1927.

### Fire at Guest, Keen & Nettlefolds.

The daily Press reports that a fire broke out on Monday last at the works power station of Messrs. Guest, Keen and Nettlefolds, Ltd., Dowlais, Glamorgan. The machinery was seriously damaged and work at the steel works and collieries was stopped, 2,500 men being affected.

### Gold Coast Electrical Imports.

During January last the imports of electrical machinery into the Gold Coast Colony were valued at £21,496, as compared with £1,071 in January, 1927.

### New French Company.

La Société Nouvelle de Constructions Téléphoniques has recently been formed in Paris (69, Rue d'Amsterdam), with a capital of three million francs.

### Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

| | CHEMICALS, &c. | Price June 12th. | Fortnight's inc. or dec. |
|---|---|---|---|
| a | Acid, Oxalic ... ... ... ... per lb. | 5½d. | ... |
| a | Ammoniac, Sal ... ... ... per ton. | £60 | ... |
| a | Ammonia, Muriate (large crystal) ,, | £52 | ... |
| a | Bisulphide of Carbon ... ... ,, | ... | ... |
| a | Borax ... ... ... ... ... ,, | £25 | ... |
| a | Copper Sulphate ... ... ... ,, | £25 10s. | ... |
| a | Potash, Chlorate ... ... ... per lb. | 3½d. to 4d. | ... |
| a | ,, Perchlorate ... ... ... ,, | 5½d. | ... |
| a | Shellac ... ... ... ... per cwt. | £13 10s. | ... |
| a | Sulphur, Commercial ... ... ,, | £11 | ... |
| a | ,, Roll ... ... ... ,, | £11 | ... |
| a | Soda, Chlorate ... ... ... per lb. | 3d. | ... |
| a | ,, Crystals ... ... ... per ton. | £5 to £5 5s. | ... |
| a | Sodium Bichromate, casks ... per lb. | 3½d. | ... |
| | **METALS, &c.** | | |
| b | Aluminium, Ingots ... ... per ton. | £105 to £112 | ... |
| b | ,, Wire ... ... ... per lb. | 1/3 to 1/9 | ... |
| b | ,, Sheet ... ... ... ,, | 1/3 to 2/9 | ... |
| p | Babbitts Metal and Anti-friction Metal— | | |
| | Grade I ... ... ... per ton net. | £201 | £9 dec. |
| | Grade II ... ... ... ... ,, ,, | £140 | £5 dec. |
| | Grade III ... ... ... ,, ,, | £75 | £2 dec. |
| c | Brass (rolled metal 2" to 12" basis) per lb. | 9¾d. | ... |
| c | ,, Tubes (solid drawn) ... ... ,, | 11½d. to 1/- | ... |
| c | ,, Wire, basis ... ... ... ,, | 9½d. | ... |
| c | Copper Tubes (solid drawn) ... ,, | 1/1½ | ½ inc. |
| c | ,, Bars (best selected) ... per ton. | £94 | £2 inc. |
| c | ,, Sheet ... ... ... ,, | £94 | £2 inc. |
| c | ,, Rod ... ... ... ,, | £94 | £2 inc. |
| d | ,, (Electrolytic) Bars ... ,, | £98 | ... |
| d | ,, ,, Sheets ... ,, | £143 10s. | ... |
| d | ,, ,, Wire Rods ,, | £78 | ... |
| d | ,, ,, H.C. Wire per lb. | 9½d. | ... |
| f | Ebonite Rod ... ... ... ... ,, | 2/3 to 2/6 | ... |
| f | ,, Sheet ... ... ... ,, | 2/3 to 2/6 | ... |
| a | German Silver Wire ... ... ,, | 2/2 | ... |
| h | Gutta-percha, fine ... ... ... ,, | 6/8 | ... |
| h | India rubber, Para fine ... ... ,, | 10½d. | ½ inc. |
| l | Iron Pig (Cleveland No. 3.) ... per ton. | £5/- | ... |
| l | ,, Wire, galv. No. 8, P.O. qual. ,, | £21 | ... |
| g | Lead, English pig ... ... ... ,, | £22 15s. | 5/- inc. |
| g | Mercury ... ... ... ... per bot. | £22 15s. | 5/- to 7/6 inc. |
| e | Mica (in original cases) small ... per lb. | 3d. to 3/- | ... |
| e | ,, ,, medium ,, | 4/- to 8/- | ... |
| e | ,, ,, large ... ,, | 10/- to 20/- & up | ... |
| p | Phosphor Bronze, plane castings ,, | 1/3½ | ... |
| p | ,, ,, drawn bars & rods ,, | 1/8 | ... |
| p | ,, ,, rolled strip & sheet ,, | 1/2½ | ... |
| p | ,, ,, wire... ... ... ,, | 1/8½ | ½d. inc. |
| e | Platinum ... ... ... ... per oz. | £17 15s. | ... |
| d | Silicium Bronze Wire ... ... per lb. | 10½d. | ... |
| r | Steel, Magnet, in bars ... ... ,, | 7½d. | ... |
| n | Tin, Block (English) ... ... per ton. | £221 10s. to £242 10s. | £6 5s. dec. |
| n | ,, Wire, Nos. 1 to 16 ... ... per lb. | 2/10 | ... |

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

# Lighting and Power Notes.

**Barnstaple.**—NEW PLANT.—The Special Lighting Committee has reported to the Town Council that the Electricity Commissioners' consent has been received to the extension of the generating station by the installation of a 100-kW Diesel engine. Application is to be made for sanction to a loan of £1,000 for prospective capital expenditure on mains, services and meters.

YEAR'S WORKING.—Reporting upon the financial position of the undertaking the chairman of the Electric Lighting Committee states that the total income for the past year was £16,058, and the expenditure £10,748, leaving a profit on the trade account of £5,310, an increase as compared with the previous year of £1,677. This has been disposed of as follows: Interest, £2,039; loan charges, £3,258; balance, £12.

**Birkenhead.**—LOAN.—The Corporation Electricity Committee is applying for sanction to borrow £30,000 in respect of mains and services, and £1,930 for e.h.p. mains and transformers.

**Blackpool.**—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to borrow £8,000 for a motor convertor and accessories, and £8,000 for a phase and and frequency changer.

**Canada.** — ELECTRICAL DEVELOPMENT. — The Provincial Government of Quebec, on May 23rd, offered at auction a lease of extensive water powers on the St. Maurice River. The Shawinigan Power Company was the only company which had complied with the terms required of bidders by depositing $1,000,000 with the Government, and secured the lease at an annual rental of about $25,000. The company, in addition, will have to pay a royalty of $1 per h.p. developed. The lease covers a number of falls and rapids situate on the St. Maurice River from its confluence with the Manquane River downwards, the two principals being the Allard and the Des Coeure Falls. The total capacity of the series is estimated at 600,000 h.p. The Shawinigan Company must commence work on the construction of the plant not later than July 1st, 1930, and must ultimately develop not less than 300,000 h.p. The company undertakes to spend at least $25,000,000 on development work, and none of the power developed is to be exported.

The Saskatchewan Government has submitted to representatives of Saskatchewan, Regina and Moose Jaw a proposal for the linking of the three cities by power transmission lines, and the operation of the three plants under one authority. It is proposed that a central plant be established to supply the maximum power possible, the present city plants functioning to supply additional electricity at peak-load periods. The plan would involve the construction of a steam plant at the Elbow of the South Saskatchewan River, a central point where a cheap coal supply is available.

**Continental.**—GERMANY.—It is reported that the German State Railway Exploitation Co. has decided to set aside a sum of £1,000,000 for investment in a number of new electricity undertakings, including the new German-Swiss hydro-electric plant which is being established on the Rhine at Niederschworstadt. The purpose of the participation is to ensure supplies of power for the railways which are being electrified in Bavaria and Baden.

NORWAY.—Preliminary plans for the development of additional hydro-electric power near Stavanger which will utilise the Maudal Falls have recently been announced by the Maudal Karftanlegg Co. The plan calls for an initial development of 4,000 h.p. with a head of 918 ft., and the construction of two storage reservoirs. The work is to be completed within about two years.

**Costa Rica.**—ELECTRICAL DEVELOPMENT.—The Bureau of Public Works has approved a concession to a local syndicate to erect an electric light plant and to divert, for this purpose, 8,000 litres of water a second from the Rio Macho. It is proposed to erect an installation of 2,000 h.p., increasing to the maximum available water-power as public demand for electricity develops.—*Reuter's Trade Service* (San José).

**Glasgow.**—ELECTRICAL FINANCE.—In a memorandum by the manager of the Corporation Electricity Department it is stated that owing to the erection and equipment of Dalmarnock station, and the large extensions of mains consequent thereon having been proceeded with immediately after the war when prices were at their peak, the capital expenditure incurred is out of all proportion to present-day costs. It is proposed to write off this excessive capital expenditure at a more rapid rate than at present by increasing the depreciation percentages. This will require an additional sum of approximately £100,000 per annum, to be met out of revenue, and it is further proposed that these increased percentages should continue for a period of five years, thus writing down the book value of the assets by an extra £500,000. It is shown that the outstanding debt at May 31st, 1927, on Dalmarnock was £1,817,231, and on mains £2,235,630. As a deficit of the previous year (£97,303) has to be met out of this year's surplus, and, in order to meet the further £100,000 required, a portion of the reserve fund will require to be used. The generating station at Pollokshaws Road has been scrapped and the plant is being disposed of. At May 31st, 1927, the written down value of the capital expenditure for the machinery and plant there was £161,790, and it is proposed that the portion of the present reserve fund remaining, after the increased depreciation percentages have been made up from that fund, should be appropriated towards the wiping off of this capital debt. Further, that any surplus arising in future years should be likewise appropriated until the whole of this asset has been written off. The Sub-Committee to which the memorandum was submitted has recommended that the proposals of the manager be agreed to.

**Hebden Bridge.**—LOAN.—The Urban District Council is applying for sanction to borrow £1,430 for electricity purposes.

**Hull.**—ELECTRICITY IN BULK.—At a recent meeting of the Corporation Electricity Committee the engineer reported that he had received an inquiry for a bulk supply of electricity from the Holderness Trust, Ltd., a statutory company which proposes to distribute electricity in the southern part of Holderness, and had quoted the company for a supply. The application of the company is for a supply in certain parishes situated between Hedon and Withersea. The action of the engineer was approved, and the proposed heads of agreement are to be submitted to the Committee in due course.

**Inverness.**—NEW REFUSE DISPOSAL PLANT.—The Town Council has decided to erect at the electricity works a refuse destructor at a cost of £12,500.

**Knaresborough.**—LOANS.—The Urban District Council has applied for sanction to loans of £1,500 for mains and services, and £150 for meters.

**Leyland.**—ELECTRICITY CHARGES.—The Lancashire Electric Power Co. has informed the Town Council that it is prepared, from the next quarter, to reduce the scale of electricity charges to the Council from 2½d. to 2d. per kWh.

**Liverpool.**—NEW POWER STATION.—At a meeting of the City Council on June 6th, recommendations by the Tramways and Electric Power and Lighting Committee that application be made for sanction to proceed with the first stage of the new power station on the Clarence Dock site by the installation of two 50,000-kW turbo-alternators, boilers, &c., and for sanction to a loan of £1,680,000 to cover the cost of the first stage, were adopted.

LOAN.—Borrowing powers are being sought by the Corporation for £15,000 for a new h.p. switchboard at the Lodge Lane sub-station and two 1,500-kW rotary convertors for the Paradise Street and Fairclough Lane sub-stations.

**New Zealand.**—AUCKLAND.—According to the *Electrical Engineer of Australia and New Zealand*, the chairman of the Auckland Power Board, Mr. W. J. Holdsworth, stated recently that when the board took over the electricity supply undertaking from the City Council five years ago there were 9,000 consumers, whereas there are now 43,000. The Council's yearly increase in consumers averaged 642, while the board's averaged 6,400. The revenue from domestic supply in 1922 was £1,599, but in 1927 it was £125,631. The total revenue of the board when formed was £139,565, but this year it will be over £600,000. When the Arapuni hydro-electric scheme was mooted the board was required to guarantee to take 15,000 kW, but it is expected that by the time the undertaking is in operation the board will require 30,000 kW.

**Panama.**—TABOGA.—A contract will shortly be placed for the installation of electrical plant for Taboga, on Taboga Island, Panama Bay. The present installation will be transferred to the small town of San Carlos.—*Reuter's Trade Service* (Panama City).

**Price Reductions.**—Reductions in the charges for electricity have been made or recommended in the following districts:—

TOTNES.—*Electric Supply Corporation, Ltd.*—Lighting: From 1s. to 10d. per kWh.

HASLINGDEN.—Lighting: From 5½d. to 5d. per kWh. Heating and cooking: Over 240 kWh per quarter, from 1d. to ¾d.

DONCASTER.—Domestic tariff: Annual charge of 12½ per cent. of the rateable value, plus ¾d. per kWh. Lighting: Flat rate of 4½d. per kWh. Reductions have also been made in the charges for the lighting of public buildings.

**Rothbury (Northumberland).**—INQUIRY.—A public inquiry into the application of Newcastle-upon-Tyne Electric Supply Co., Ltd., to supply electricity to Rothbury sub-station by a h.p. overhead line and to distribute it in the village by l.p. overhead lines, was held at Rothbury on May 31st by Lieut.-Col. F. Gordon Tucker, for the Ministry of Transport. Mr. C. B. Fenwick appeared for the applicants, and explained that Rothbury Urban District Council had refused to consent to the l.p. overhead line, and Mr. Angus Watson had refused to consent to a proposal to carry a h.p. overhead line across a portion of his land. Dr. Charlesworth, for the Urban District Council, and Mr. Angus Watson said the residents were opposed to having the town disfigured by poles. After hearing the evidence, the inspector was conducted over the proposed route, and intimated that his decision would be communicated in due course.

**Rotherham.**—ELECTRICITY *v.* GAS.—The rivalry between the Rotherham Electricity and Gas Departments has been the subject of inquiry by a committee of the Town Council and at a recent meeting of the Council a report was presented in which it was recommended that no further canvassing be allowed by firms or outside individuals for the wiring of consumers' houses, but that if it be found necessary in the future to canvass that such work be undertaken by the paid staff of the Corporation. It was also recommended that the number of houses or other premises in the gas area to be wired for electricity under the assisted scheme should be fixed at a rate not exceeding 1,000 per annum, and that failing agreement on any matters arising therefrom the chairmen of both departments deal with the subject. The Council approved the report.

**Saddleworth.**—SCHEME POSTPONED.—The Urban. District Council has decided to defer for the present consideration of a street electric lighting scheme.

**Seaton (Devon).**—ELECTRICITY SUPPLY.—The Seaton and District Electric Light Co., Ltd., is installing a Petter 135-b.h.p. engine and d.c. generator at its central station which will supply electricity to the Seaton and Beer district.

**Sheffield.**—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to loans of £2,384 for rectifying plant for Hangingwater Road sub-station, and £6,000 for water cooling towers.

MAINS EXTENSIONS.—The Committee has decided to carry out mains extensions at a cost of £9,880.

**Special Orders.**—Applications have been made to the Electricity Commissioners for Special Orders by Hull Corporation authorising it to supply electricity in the boroughs of Beverley and Hedon, the urban district of Cottingham, and parts of the rural districts of Beverley, Skirlaugh, Sculcoates, and Patrington; the Burnham and District Electric Supply Co., Ltd., to supply electricity in the urban district of Burnham (Somerset); and the Southern Tanning Co. (1920), Ltd., to supply in part of the rural district of Salisbury.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Northampton Electric Light and Power Co., Ltd., to supply electricity in the rural districts of Crick, Middleton, Cheney and Brackley, the borough of Brackley, and parts of the rural districts of Brixworth, Oxenden, and Salisbury; and the Llanelly and District Electric Supply Co., Ltd., to supply in the borough of Kidwelly and parts of the rural districts of Carmarthen, Llandilo Fawr, and Llanelly.

**Stafford.**—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. W. H. Robins) for the year ended March 31st last, record a total revenue of £50,030, as compared with £48,460 in the preceding year. Working expenses amounted to £21,753, as against £28,411, and after meeting loan charges, &c., there was a net surplus of £5,176, as compared with a deficit of £1,536 in 1926-27. The capital expenditure during the year amounted to £19,929, the chief item being £11,623 for mains and services. The sales of electrical energy increased from 6,668,121 to 7,809,171 kWh, and the maximum supply demanded from 3,939 to 4,232 kW. The average price obtained per kWh fell from 1.74d. to 1.54d.

**United States.**—ELECTRICAL DEVELOPMENT.—The New Jersey Power & Light Company is constructing the first 50,000-kW unit of a 200,000-kW ultimate capacity plant at Holland, N.J., on the Delaware River, about eight miles below Easton, Pa. It will be the main generating plant in the eastern part of the Pennsylvania-New Jersey System. According to *Power*, the boiler units are being constructed for 1,400-lb. steam pressure to allow ample pressure drop between boiler drums and 1,200-lb. pressure at turbine throttle. Two identical boiler units will generate 250,000 lb. of steam per hour each at 1,400 lb. pressure, 750 deg. F., and reheat at approximately 400 lb. pressure to 750 deg. F. Pulverised fuel will be used. The 50,000-kW turbine will be of the cross-compound type, the high-pressure unit operating at 3,600 r.p.m. and the low-pressure unit at 1,800 r.p.m., the ratio of the capacity of the high-pressure unit to that of the low-pressure unit being in the order of 1 to 4. The foundation work is under way now, and it is expected that the plant will go into operation during the latter part of 1929.

Plans are under way by the Commonwealth Power Corporation, of Jackson, Mich., for a new generating station for the Southern Indiana Gas & Electric Company at Evansville, Ind., which will be known as the Ohio River steam plant. This station will have an ultimate capacity of 100,000 kW. The initial installation will be a 12,500-kW Allis-Chalmers turbine and condenser. The new plant will operate on a pressure of 400 lb. and a total temperature of 700 deg. F. With the initial installation two boilers will be provided, each having a capacity of 130,000 lb. of steam per hour.

**West Ham.**—INQUIRY.—The Electricity Commissioners have appointed Col. T. C. Ekin to hold an inquiry at the Town Hall on June 19th into the application of the Corporation for sanction to borrow £282,800 for electricity purposes.

**York.**—INAUGURATION OF NEW PLANT.—The new 6,000-kW turbo-generator recently installed at the Corporation electricity works was formally started up by the Lord Mayor on June 7th. The station now has a capacity of 20,500 kW.

# Tramway and Railway Notes.

**Argentina.**—BUENOS AIRES.—Work is to start immediately on the Lacroze subway, from the docks to the Chacarita, serving the Plaza Lavalle and Retiro, and running *via* the Calles Corrientes and Triunvirato. Six stations will be constructed. The tunnel will be built on a similar plan to that of the Anglo-Argentine Tramways subway (between the Retiro and Constitución railway termini), but in some places it will be sunk to a much lower depth. The first section, of open construction, will run from the Chacarita to the junction of Calles Callao and Corrientes; from the Calle Callao to Retiro, the line will pass entirely underground. The removal and diversion of existing water and drain pipes will be necessary; this part of the work will take a full year. The total cost of the construction is estimated at 50,000,000 pesos paper.

The construction will shortly commence on the Avenida del Campo of a new station to provide power for the Lacroze tramway system, serving principally the Buenos Aires docks.—*Reuter's Trade Service* (Buenos Aires).

**Canada.**—NEW ELECTRIC RAILWAY.—An electric railway from Whitemouth to the Seven Sisters Falls and Lac Du Bonnet, in the Central Manitoba mining area and the hydro-electric power centre of Central Manitoba, is to be constructed by the Manitoba Eastern Railway Company, a subsidiary of the Winnipeg Electric Company.—*Reuter's Trade Service* (Winnipeg).

**Continental.**—ITALY.—*New Locomotives.*—The Italian State Railway authorities have lately carried out the acceptance trials of the first electric locomotive of a capacity of 1,700 kW designed to work at 3,000 V d.c. and intended for the Benevento-Foggia line. The trial comprised a run on a descending gradient of 0.01 per cent. up to a speed of 47 m.p.h. with a 350-ton train, a run of 250 miles with a 400-ton train, and several "recuperation" tests at speeds between 15 and 45 m.p.h. on descending gradients exceeding 0.015 per cent.

**Doncaster.**—RAILLESS CARS.—At a meeting of the Corporation on June 6th, the chairman of the Electricity and Tramways Committee said that the highway from the centre of the town to the racecourse required remaking, and if the Tramways Committee was called upon to repair its portion each side of the rails it would cost £12,000. As the Committee had decided to scrap this tramway, it was not in a position to pay the cost and therefore recommended a service of railless cars on this route. The Committee also proposed to replace the Hyde Park tramway by a railless-car system, and eventually connect it with the racecourse route. This would cost £6,700, and a further £8,800 for the purchase of four railless cars. The chairman asked the Council to commit itself to the policy of converting the Beckett Road, Avenue Road, and Hexthorpe tramway routes.

**Hull.**—TRAMWAY SUPPLY.—At a recent meeting of the Corporation Tramways Committee the general manager referred to the proposal to take a supply of electrical energy from the Sculcoates Lane power station, and submitted a further report on the present condition of the plant at Osborne Street. He also reported on an interview with the chairman of the Electricity Committee and the city electrical engineer with regard to the cost of supplying electricity in bulk to the switchboard at Osborne Street. It was decided to ask the Electricity Committee to reconsider its quotation and to state the lowest terms on which it would be prepared to supply electrical energy in bulk.

TRACK RENEWAL.—The city engineer reported that the track in Alfred Gelder Street on the Whitefriargate to Lowgate section should be renewed, and asked for authority to invite tenders for the work. The Committee decided that tenders be invited for the work and that the city engineer also submit estimates for carrying out the work by his department.

**Southern Railway.**—ELECTRIFICATION PROGRESS.—*The Times* reports that the Southern Railway Co. will introduce important changes on the central and eastern suburban sections of its system on June 17th, as the result of the completion of the second stage of its electrification scheme. The extent of track involved is 79 miles, about half of which will be converted from the overhead wire system, so that the whole will have the third-rail system. The equipment, which has cost over £1,000,000, includes 136 new passenger coaches and five sub-stations. The lines embraced are those between London Bridge and Victoria, and between London Bridge and Epsom Downs, *via* Norwood Junction and West Croydon. The portion of line from Sutton to Epsom Downs will have electric traction for the first time. Additional services will be provided from London Bridge and back over two "loops," *via* Forest Hill, Crystal Palace, and Tulse Hill, and *via* Norwood Junction, Thornton Heath, and Streatham, and during the business hours a new service will be instituted from London Bridge to Coulsdon North *via* Norwood Junction. The introduction of the new services has necessitated the most extensive change in the method of signalling yet undertaken by the company. The present signalling at all the London Bridge stations will be abolished, as well as that between London Bridge and Bricklayers' Arms Junction, 2¼ miles away, near New Cross, all of which is now worked by nine different signal boxes. On and after June 17th the London Bridge signalling will be done from a new "power" box which is stated to be the largest of its kind in the world. It has three storeys and contains 311 electrically-operated miniature levers which will be manned by 16 signalmen and eight lads who will deal with 2,000 trains a day. The semaphore signals will disappear, giving place to the coloured lights similar to those now used on other parts of the system. The signalling operations have hitherto required about 74 workers; under the new system of electrically-operated levers about 24 only will be needed.

**Sunderland.**—YEAR'S WORKING.—The report of the general manager and engineer of the Corporation tramway undertaking (Mr. A. R. Dayson) on the working of the undertaking for the year ended March 31st last shows a total income of £128,899, and working expenditure of £101,361, leaving a gross profit of £27,538. The figures for the preceding year were: Income, £114,977; working expenses, £97,357; gross profit, £17,619. To the gross profit was added a balance of £63 from the motor-omnibus service (commenced in February last), and an unemployment grant of £131, making a total of £27,732 available, and after payment of capital and income tax charges there was a balance of £22,713, which was allocated as follows:—Repayment of loans, £10,936; renewals of cars and trucks, £1,214; chassis for new tower wagon and van, £602; Whitburn Road siding, £1,160; to borough fund, £1,500; to renewals fund, £7,301. The capital expenditure dur-

ing the year amounted to £12,671, the bulk of which was spent on permanent way. The number of passengers carried increased from 27,393,032 to 30,921,458, and the car miles run from 1,619,078 to 1,701,470. The revenue per car mile rose from 17.043d. to 18.182d.

**Warrington.**—Doubling of Track.—The Corporation Tramways Committee is to apply to the Ministry of Transport for approval of the substitution of a double tramway track for the existing single track from Glasebrook Street to the cemetery terminus.

# Telegraph and Telephone Notes.

**Canada.** — Radio Communication. — Representatives of Canada have been invited to confer in Washington at an early date on the allocation of short wave-lengths used in trans-oceanic and long-distance radio transmission. The United States Federal Radio Commission is engaged on the preliminary work of establishing a basis for the allocation of short wave-lengths among American corporations; before a final decision is made, says *World Radio*, it wishes to come to some understanding with Canada which will prevent interference between the two countries in trans-oceanic wireless.

**China.**—Automatic Telephony at Singapore.—The Oriental Telephone and Electric Co. has decided to replace the present plant by an automatic exchange on January 1st, 1930. The existing central exchange has a capacity of 5,000 lines, which will be in full use by the end of 1929, and then the new system will provide accommodation for 6,600 lines, with an ultimate capacity of 10,000. According to *Indian Engineering*, at first the company intended to keep the manual exchange until it had served its full economic life, and to build an automatic exchange for increasing requirements. It was realised, however, that the operating staff would have to be supplemented considerably for the transition stage and the company has experienced great difficulty in meeting its present needs, despite an increased scale of pay; as a result it was decided to embark upon the full automatic scheme without delay. The system to be adopted is that used by the British Post Office, known as the "step by step," and the equipment will be of British manufacture.

**International Telephony.**—Gibraltar Service.—The British Postmaster-General announced on June 8th that on that date a telephone service between England and Gibraltar became available, *via* Madrid, Spain.

Czecho-Slovakia.—It was also announced on June 7th that the Anglo-Czecho-Slovakian service, hitherto in operation between all places in this country and Prague and Aussig (Usti nad Labem) only, had been extended to the whole of Bohemia, Moravia, Silesia, and the western part of Slovakia. The service will be further extended to Eastern Slovakia as soon as technical conditions permit.

**Nicaragua.**—Communication Services.—In his report to the Department of Overseas Trade on the economic situation of the country, Mr. H. Patteson (H.M. Consul, Managua) includes the following information relative to the telegraph and telephone services, which are operated by the Government:—

Telephony.—There were 53 public telephone offices in 1926 and 1,200 kilometres of telephone wire; 1,094 telephone instruments were in use. The service between Granada, Managua León, Chinanaaega and Corinto, which are the principal stations on the Pacific Railway, is, on the whole, good, but telephone connection from any of these cities to the smaller towns of the interior is poor.

Telegraphy.—In 1926 the total length of lines was 2,840 km. The service is fairly satisfactory.

Submarine-cable Telegraphy.—The All-America Cable Co. provides an efficient service.

Radio-telegraphy.—The Tropical Radio Telegraph Co., a subsidiary of the United Fruit Co., possesses a powerful station in Managua with a 20-kilowatt output and two small branch stations with 1-kilowatt outputs at Bluefields and Cabo Gracias. The Managua station transmits direct to New Orleans and Miami, and the other two have only a small radius of about 500 miles. The rates and service compare very favourably with those of the Cable Company.

**Radio-Telegraphy.**—"Beam" Developments.—It is understood that further important developments may be expected shortly, as Marconi's Wireless Telegraph Co., Ltd., is nearing the completion of experiments for the simultaneous transmission of wireless telephony and wireless telegraphy on the "beam" system. According to the daily Press, tests are taking place across the Atlantic with apparatus which it is claimed will operate two high-speed telegraph circuits simultaneously with one duplex telephone circuit, utilising the same transmitter and aerial and only one wave-length for all three circuits. It is also reported that the company is building an experimental plant at Poldhu, Cornwall, for a "swinging beam." The angle of the "beam" is reduced to eight or nine degrees, and it can be swung to serve any distant point with which communication is desired. In this way a single transmitting station can provide a "beam" service to a large number of countries. The "beam" may be "swung" in 60 seconds and the reflector, which is the important component of the "beam" transmitter, will be revolved, so that a message can be sent in any direction.

**U.S.A.**—Underground Mine Telephony.—The United States Bureau of Mines has been experimenting with various systems of establishing communication between rescue parties and entombed miners following mine fires and disasters. A report just issued states that excellent results have been obtained with the grounded-line or roof-rail conduction method of communication with telephones. The transmitter in this system is an ordinary microphone used straight or with amplification. The apparatus is fairly simple, except possibly when amplification is used. The receiver is the simplest of all, being of the watchcase-type telephone pattern. The wiring inside the mine is very short, extending from the roof to the rail or floor connections. The roof connection for receiving is very simple, but for transmitting the connection has to be more extensive because the current flowing is many times that of reception. At the surface the roof-rail system requires an insulated line from the nearest available connection to the mine floor or track to a point within a radius of approximately 500 feet over the place in the mine where the underground station is located. As this line is on the surface, however, it should involve no difficulty. The roof-rail method can be used for either voice or code signals. Tests made with telephony have shown the possibility of penetrating depths of more than 430 feet at a distance of more than 1,700 feet from the shaft without amplification.

# Radio Notes.

**France.**—Lille Station.—The Conseil Général du Nord has shown its appreciation of the Lille broadcasting station, says *World Radio*, by increasing its subvention from 5,000 fr. in 1927 to 25,000 fr. this year.

**Cuba.**—School Reception.—To provide popular broadcast lectures at educational establishments in Cuba, from the university to the smallest school, the Department of Public Instruction is supplying complete wireless sets on loan, with the ulterior intention of presenting them to the schools for permanent use.—*Reuter's Trade Service* (Habana).

**Germany.**—Receiving Sets for the Blind.—Under a scheme for providing poor blind persons and institutions for the blind with wireless sets, the German Post Office authorities have collected nearly £30,000, in addition to gifts of apparatus. The German State does much for the help and comfort of its blind.—*Reuter* (Cologne).

### A Portable Electric Harmonic Analyser.

Mr. R. Thornton Coe, B.A., M.Sc. (Tech.), A.M.I.E.E., recently demonstrated at a meeting of the Physical Society of London an instrument which is used by the British Thomson-Houston Co., Ltd., for measuring small harmonics in voltage or current waves. The determination of each harmonic is made separately from steady readings on two instruments, and only takes a few minutes. The amplitudes of small harmonics in voltage waves are found correct to at least 1/20th of 1 per cent. of the fundamental. The method embodies the mathematical principle of obtaining the $n$th harmonic in a wave by multiplying by sin $npt$ and integrating over a complete period. The current to be analysed is passed through the moving coil of a dynamometer, while through the fixed coil is passed a sinusoidal "analysing current" of exactly the frequency of the harmonic under investigation: this is obtained by the use of a tuned circuit, valves, and a synchronously-driven contact disk. The phase of the analysing current is changed to give a maximum dynamometer reading $D_{max.}$, where $D_{max.} = k\, I_a\, I_n$. The analysising current $I_a$ is measured by a thermal ammeter and, since $k$ (the dynamometer d.c. calibration constant) is known, the required harmonic of current $I_n$ can readily be calculated. A large current is analysed by connecting a suitable shunt across the dynamometer moving coil, while a voltage is analysed by connecting a fixed condenser in series. The apparatus was shown in operation upon the voltage wave-form of current taken by a small auto-transformer supplying the synchronous motor of the analyser. The most prominent harmonics in the voltage wave were the 3rd, 5th and 7th, and also the 17th and 19th. The former (of amounts 2.1, 3.9 and 1.25 per cent., respectively, on a fundamental of 112 volts) were due to the somewhat rectangular wave-form of flux distribution round the armature, while the latter (of amounts 3.0 and 1.5 per cent., respectively) were due to the ripple of flux caused by the slots in which the armature conductors are placed. The transformer current wave showed large 3rd and 5th harmonics of amounts 13.1 and 4.6 per cent., respectively, on a fundamental of 5.2 amps. These large harmonics were due to the well-known distortion of the magnetising current wave of a transformer when the maximum flux-density is sufficient to saturate the iron core.

# Contract Information.

**When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.**

## Contracts Open.

**Ammanford.**—Amalgamated Anthracite Colfieries, Ltd. Six months' supply of electrical goods. Particulars from the Stores Department, Central Colliery Offices, Ammanford.

**Argentina.**—BUENOS AIRES.—July 19th. National Sanitation Works Department. 24 electric sewage pumping plants. (A.X. 6389.)*

**Atherton.**—June 28th. Urban District Council. Two 130-kVA transformers. (June 8th.)

**Australia.**—MELBOURNE.—July 17th. Postmaster-General's Department. Switchboard cable. (B.X. 4431.)*

Automatic telephone switchboards. (B.X. 4480.)*

June 19th. Adhesive insulating tape. (B.X. 4492.)*

August 14th. Junction apparatus for manual exchanges. (B.X. 4486.)*

**Belfast.**—June 18th. Electricity Department. Overhead transmission line between Stockman's Lane at Balmoral and Black's Lane at Dunmurry. (June 8th.)

**Belgium.**—June 20th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supplying and laying telephone cable at Bruges, Roulers, Termonde, Tournai, and Ghent. Particulars (Cahier des Charges Special No. 9-313) for 16 fr.

June 22nd. Municipal authorities of Ixelles, Brussels. H.p. and l.p. armoured cable. Particulars for 5 fr. from Service de l'Electricité, 20, Rue d'Alsace Lorraine, Ixelles.

**Birmingham.**—June 28th. Board of Guardians. Electric lighting work in connection with the modernisation of Western Road House. Specification £2 2s., from Mr. C. F. Beech, clerk to the Guardians, Union Offices, Edmund Street, Birmingham.

**Blantyre, Nyasaland.**—Town Council. One 120-h.p. cold-starting crude-oil engine, direct coupled to a 120-kVA a.c. generator, with exciter, or alternatively, one 120-h.p. suction gas engine, direct coupled to an a.c. generator; 500 tons best anthracite beans. (June 1st.)

**Caithness.**—June 22nd. Education Authority. Electrical wiring of five schools in the Burgh of Wick. Specifications, &c., from Mr. J. E. MacEwan, engineer, 108, Douglas Street, Glasgow.

**Chile.**—SANTIAGO.—June 20th. Arica-La Paz Railway. One d.c. Diesel-driven electric generating set. (B.X. 4501.)*

**Conisborough.**—June 19th. West Riding Education Committee. Electric lighting installation at the New Middle School. Specifications from Education Department, County Hall, Wakefield.

**Douglas.**—July 2nd. Corporation. One 1,000-kW steam turbo-alternator, condensing plant, cooling tower and accessories, two 15,000-lb. boilers, with pipework and accessories. (June 1st.)

**Ecuador.** — GUAYAQUIL. — July 31st. Government of Ecuador. One 5-ton (metric) and one 10-ton (metric) electrically-operated portal crane. (A.X. 6387.)*

**Edinburgh.**—June 25th. Education Authority. Complete electrical installation for four schools and janitors' houses. Schedules from offices of the Authority.

**Erith.**—June 25th. Electricity Department. H.p. cables. (See this issue.)

**Greenock.**—July 2nd. Trustees of the Port and Harbours. Electrification of the Garvel pumping station, altering steam pumps to electric drive or, alternatively, two electrically-driven dock pumps, electrically-driven hydraulic pumps, &c. Specifications (42s.) from Mr. A. Leitch, consulting engineer, 65, Bath Street, Glasgow.

**Guiseley (near Leeds).**—June 19th. West Riding Education Committee. Electric lighting installation at the new school. Specifications from Education Department, County Hall, Wakefield.

**Hawarden.**—June 22nd. Urban District Council. Overhead transmission lines. (June 8th.)

**Hull.**—June 21st. Electricity Department. Twelve months' supply of electric lamps. Specifications from Mr. H. Bell, city electrical engineer, Electricity Works, Sculcoates, Hull.

**India.**—SIMLA.—July 2nd. India Stores Department. Equipment for the Sumera hydro-electric pumping and power supply scheme. (B.X. 4483.)*

**Leeds.**—The Electricity Committee is inviting tenders for an overhead crane and locomotive required for Kirkstall power station.

June 18th. Education Committee. Electric lighting of schools during midsummer vacation. Particulars, Architect's Section, Education Offices, Calverley Street.

June 22nd. Board of Guardians. Supplying and fixing a battery-charging equipment at St. James' Hospital, Beckett Street, Leeds. Specifications from Mr. J. E. Storr, 14, Park Row, Leeds.

June 28th. Libraries and Arts Committee. Alterations to the electric lighting installation in the Lending Department of the Central Library. Specifications from Mr. W. T. Lancashire, city engineer, Municipal Buildings, Leeds.

**London.**—CENTRAL ELECTRICITY BOARD.—June 29th. 132,000-V overhead transmission lines for the South-East England electricity scheme. (May 18th.)

WANDSWORTH.—June 20th. Board of Guardians. Reorganisation of the engineering plant (laundry, central heating, electric lighting, and water softening) and electric wiring at the Swaffield Road Institution. (June 8th.)

LONDON COUNTY COUNCIL.—July 9th. Soot extraction plant for the Greenwich power station. (See this issue.)

June 26th. Electric lighting installation at the Dockhead Fire Brigade Station, S.E. (about 80 lighting points). (See this issue.)

BETHNAL GREEN. — June 26th. Board of Guardians. Internal telephone system for the administrative offices in Bishop's Road, E. (See this issue.)

**Newport (Mon.).**—June 30th. Electricity Department. Three kiosk transformer sub-stations. (See this issue.)

**New Zealand.**—WELLINGTON.—July 10th. Public Works Department. 50-kV switchgear and steelwork for Arapuni power scheme. (B.X. 4410.)*

July 17th. Two 12-ton trolley electric locomotives, four 4-ton ditto, seven 4-ton battery locomotives, with spares, two 150-kW motor-generator sets and switchgear, and overhead line equipment. (A. 6317.)*

August 14th. 50-kV switchgear and steelwork for Arapuni electric power scheme. (B.X. 4477.)*

June 26th. Posts and Telegraph Department. Telephone cords. (B.X. 4472.)*

**Nottingham.**—July 3rd. Electricity Committee. General stores for 12 months. (See this issue.)

**Plymouth.**—June 27th. Electricity Department. Stoneware conduit. (See this issue.)

**South Africa.**—JOHANNESBURG.—July 26th. South African Railways and Harbours. Two 25-ton, six 10-ton, and two 2-ton electrically-driven overhead travelling cranes. (A.X. 6347.)*

July 12th. 120-kV transformers and truck-type switchgear. (B.X. 4479.)*

June 28th. Poles, cross arms, copper binders, copper tapes, bare copper wire, &c. (A.X. 6399.)*

July 19th. Electric incandescent lamps. (B.X. 4487.)*

KYSNA.—July 6th. Municipal Council. Installation of an electric lighting and power system. (B.X. 4493.)*

**Stone.**—July 3rd. Urban District Council. E.h.p. and l.p. cable and l.p. overhead distribution and service lines. (See this issue.)

**Sunderland.**—July 9th. Electricity Department. Cable, r.i. wire, consumers' meters, and incandescent lamps for 12 months. (June 8th.)

**Swindon.**—July 7th. Electricity Department. Steam, exhaust, water and other pipework, valves, tanks, evaporators, &c. (See this issue.)

**Tain.**—July 4th. Corporation. Underground and overhead mains, street lighting, and meters. (June 1st.)

**Taunton.**—June 18th Electricity Committee. Paper-insulated cables. (June 8th.)

**Uruguay.**—MONTEVIDEO.—July 13th. State Electricity Supply Works. Twelve 3-phase, 33,000-V transformers. (B.X. 4461.)*

**Wrexham.**—June 26th. Board of Guardians. Electric lighting installation at the Institution. Mr. J. Bagnall Bury, clerk, 23, Chester Street.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

# Contracts Closed.

**Australia.**—MELBOURNE.—Postmaster-General's Department.
Jumper wire (£2,391).—British Insulated Cables (Pty.), Ltd.
Insulated wire (£282).—Connollys (Blackley), Ltd.
Cable terminal boxes (£4,253).—Siemens (Aust.) Pty., Ltd.
Telegraph instruments (£410).—Walters Electrical Co., Ltd.
Condensers (£1,141).—Telegraph Condenser Co., Ltd.
Protective apparatus.—Automatic Telephones, Ltd. (£3,939); R. O. Whitford (£1,575).
SYDNEY.—New South Wales Railways.
1,500-V d.c. switchgear (£4,810).—Australian General Electric Co., Ltd. —*Tenders.*

**Birkenhead.**—Electricity Committee. Accepted:—
Cable (£4,687).—Hackbridge Cable Co., Ltd.

**Blackburn.**—Town Council. Accepted:—
New cooling towers.—Premier Cooler & Engineering Co., Ltd.

**Bolton.**—Tramways Committee. Accepted:—
40 tramcar motors.—General Electric Co., Ltd.

**Bury.**—Town Council. Accepted:—
Transformer for C.W.S. electricity sub-station, Dumers Lane.—Metropolitan-Vickers Electrical Co., Ltd.

**Carlisle.**—City Council. Accepted:—
Wiring and installing electric light at 54 houses on the housing estates.—William Batey & Sons.

**Chichester.**—Electric Light Committee. Recommended:
Three single-phase transformers (£339).—Hackbridge Electric Construction Co., Ltd.
Two switch cubicles (£444).—English Electric Co., Ltd.

**Doncaster.**—Electricity Committee.
H.p. terminal switchgear for Bentley supply feeder (£164). —Ferguson, Pailin, Ltd.
L.p. cables (£1,173).—Callender's Cable & Construction Co., Ltd.

**Glasgow.**—Electricity Committee. Recommended:—
Cables (single, triple concentric, and telephone).—Power and Lighting Cables, Ltd.
L.p. cables.—Power & Lighting Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; and the Enfield Cable Works, Ltd.
E.h.p. cables.—W. T. Glover & Co., Ltd.; Callender's Cable & Construction Co., Ltd.; and Power & Lighting Cables, Ltd.
Rubber insulated.—Thomas Land & Son; the Edison Swan Electric Co., Ltd.; and Hackbridge Cable Co., Ltd.
Flexibles.—Craigpark Electric Cable Co., Ltd.
D.c. meters.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.; Fox & Offord, Ltd.; and Measurement, Ltd.
A.c. meters.—Chamberlain & Hookham, Ltd.; Edison Swan Electric Co., Ltd.; Ferranti, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Measurement, Ltd.; and Electrical Apparatus Co., Ltd.
Arc lamp carbons.—General Electric Co., Ltd.
Cast-iron boxes, section pillars, &c.—James Allan, Sen., and Son, Ltd.; Carron Co.; Falkirk Iron Co., Ltd.; McDowall, Steven & Co.; Walter McFarlane & Co.; and Robert Taylor & Co.

At a special meeting of the Electricity Committee, held later, Bailie Park moved that the recommendation that the offers of the Power & Lighting Cables, Ltd. (specifying cable manufactured by the Deutsche Kabelwerke A.G., Berlin) be accepted for various classes of cable, be disapproved, and that the lowest British offers for these cables be accepted. On the vote being taken, this was lost, 3 being for and 11 against.

Gas Committee. Recommended:—
Electric cables for booster house at the Dawsholm Gas Works (£167).—William Brown & Co. (Engineers), Ltd.

**Hull.**—Telephones Committee. Accepted:—
Bronze wire (£287).—F. Smith & Co.
Lead-in wire.—W. F. Dennis & Co.
Switchboards.—Ericsson Telephones, Ltd.

**Lamp Contracts.**—The British Thomson-Houston Co., Ltd., has received a ten months' contract for train lighting lamps from the London & North-Eastern Railway Co. The General Post Office has placed a contract for 60,000 Robertson carbon filament lamps; and the Metropolitan Borough of Holborn has contracted for 12 months' supply of electric lamps with the General Electric Co., Ltd.

**Leeds.**—Tramways Committee. Accepted:—
Track lay-outs (£630); guard rail (£240).—Edgar Allen and Co., Ltd.
Electricity Committee. Accepted:—
Passenger lift at new electricity showrooms (£429).—R. A. Evans, Ltd.
Goods lift at showrooms (£429).—Pickerings, Ltd.
Cables.—(£750) Enfield Cable Works, Ltd.; (£1,911) Macintosh Cable Co., Ltd.; (£520) W. T. Henley's Telegraph Works Co., Ltd.
Sub-station switchgear.—(£1,155) English Electric Co., Ltd.; (£763) Ferguson, Pailin, Ltd.; (£685) Metropolitan-Vickers Electrical Co., Ltd.

**Lincoln.**—Corporation. Accepted:—
Electric lighting installation for the Corporation showrooms.—W. Wright & Son, Ltd.

**London.**—LAMBETH.—G.W.R. Co. Accepted:—
Two 30-cwt. electric lifts at South Lambeth goods station. —Titan Lift Co.

**Liverpool.**—City Council. Accepted:—
Tramway junctions.—Edgar Allen & Co., Ltd. (£1,267); Hadfields, Ltd. (£2,656).
Feeder panel (£234).—Ferguson, Pailin, Ltd.
One 1,250-kVA transformer (£500).—Metropolitan-Vickers Electrical Co., Ltd.
H.p. switchboard (£5,260).—English Electric Co., Ltd.
Two 1,500-kW rotary convertors, with transformers (£9,000).—Crompton-Parkinson, Ltd.
Steam pipes for Lister Drive (£2,826).—Babcock & Wilcox, Ltd.

**Sleaford.**—Urban District Council Electricity Committee. Recommended.
Supply and laying feeder cables between Monument Corner and Westgate:—

| | |
|---|---|
| Metropolitan Electric Cable and Construction Co., Ltd. (not including testing, warning boards or tiles) ... ... ... ... ... | £656 |
| Pirelli-General Cable Works, Ltd. ... ... | 675 |
| Siemens Bros. & Co., Ltd. ... ... ... ... | 679 |
| W. T. Glover & Co., Ltd. ... ... ... ... | 682 |
| W. T. Henley's Telegraph Works Co., Ltd. ... | 681 |
| Johnson & Phillips, Ltd. ... ... ... ... | 682 |
| Macintosh Cable Co., Ltd. ... ... ... ... | 688 |
| Enfield Cable Works, Ltd. ... ... ... | 688 |
| British Insulated Cables, Ltd. ... ... ... | 698 |
| Standard Telephones & Cables, Ltd. ... ... | 701 |
| CALLENDER'S CABLE & CONSTRUCTION CO., LTD. (Recommended.) ... ... ... ... .. | 668 |

**Stone.**—Urban District Council. Accepted:—
11,000-V overhead transmission line (£2,200).—J. Collier and Co., Ltd.

# Forthcoming Events.

**British Electrical Refrigeration Campaign.**—June 8th to June 25th.
**Association of Mining Electrical Engineers.**—Friday, June 22nd. Buxton. Annual meeting.
**Institution of Electrical Engineers.**—June 25th-30th. Glasgow. Summer meeting.
**Electrical Contractors' Association.**—July 4th-6th. Cheltenham. Annual conference.

# The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

An electrically-heated needle or pencil suitable for burning designs on felt or wood.

# Notes.

### The Electrical Engineers' Ball.

We learn from the joint hon. secretaries (Messrs. A. M Sillar and C. W. Hill) that the General Committee, at its meeting held on June 6th at the I.E.E., voted the sum of £160, the proceeds of the Electrical Engineers' Ball (the nineteenth) held on February 10th, 1928, to be equally divided between the I.E.E. Benevolent Fund and the Electrical Trades Benevolent Institution. The dance was as great a success as its predecessors, there being over 700 present. It may be of interest to remark that this Ball was initiated purely as a social gathering, with no intention of making profits, but since its inception the General Committee has been able to hand over the sum of £1,590 to the two Benevolent Funds mentioned.

### Rural Supply in South Australia.

At the annual social and general meeting of the Institute of Engineers, Australia, Mr. J. R. Brookman (the retiring chairman, who occupied the chair) addressed the gathering on the above subject. New Zealand had made a definite move towards supplying electricity to farms, he said, according to the Adelaide *Register*, and the first step in South Australia was taken in 1912, when a supply was given by the Adelaide Electric Supply Co. to market gardeners at Campbelltown, who pumped water from the River Torrens for their vegetable gardens. Several economies were effected in the building of overhead lines, which made the scheme a payable proposition.

In 1922 the whole of the pumping in the Torrens Valley from Athelstone to Fulham was done by electricity, and motors were also connected to lucerne growers' wells lying between Findon and Plympton, and also in the Marion district. In 1924 a more ambitious project was put forward for extension of lines to Piccadilly and the Mount Lofty district. The next year the power was extended to Uraidla, and then to Aldgate, Bridgewater, Ambleside, and Mount Barker. Later it was sent to Littlehampton and Nairne to supply brickyards, bacon factories, and a flour mill. The rural consumers now numbered 450, with 3,400 horse-power of motors connected, which brought in a revenue of £10,000 a year, and, in addition, household requirements netted £3,000 a year.

The Mid-North Electricity Supply Co. was operating about 70 miles of 11,000-volt transmision lines connecting the towns of Clare, Seven Hills, Watervale, Auburn, Saddleworth, Riverton, Mintaro, Marrabel, and Eudunda. The Onkaparinga Electric Supply Co. was operating about 20 miles of line connecting the towns of Balhannah, Oakbank, Woodside, and Tweedvale. The plant of the Gawler Corporation was acquired in 1923, and connected with a 33,000-volt transmission line from Port Adelaide. In 1925 the company was in a position to supply Freeling, Nuriootpa, Angaston, and Kapunda. A 36-mile line was then built to Balaklava, and it had since been extended through Blyth, Brinkworth, Georgetown, Gladstone, Caltowie, to Jamestown. The wineries in Angaston and Nuriootpa had been served, and a 30-mile line had been extended through Reynella to McLaren Vale and Willunga, and a branch line to McLaren Flat. The main difficulty in supplying farms was the length of line required. The average of each length was more than a mile, and the power requirements were small and brought in less than one-third of the revenue received from a given service to market gardeners. The Adelaide Electric Supply Co. had found that the most satisfactory arrangement for all parties was to supply free one-third of a mile of line to each farm, charge the farmer for the balance, and give him a rebate for all electricity used in excess of a stipulated amount. He had no doubt that there would be a steady growth in the use of electricity in rural areas.

### The British Association.

It is announced that Sir William Bragg, the president-elect of the British Association for the Advancement of Science, will take as the subject of his address at the Glasgow meeting (September 5th to 12th) "Craftsmanship and Science."

### Linking Mechanical and Electrical Vibrations.

At a recent meeting of the Physical Society of London a paper by Dr. W. H. Eccles, M.I.E.E., F.R.S., and Miss W. A. Leyshon, B.Sc., Ph.D., was read by the latter and illustrated with a demonstration. It described a number of new methods whereby the frequency of an electric oscillatory circuit can be brought under the control of a tuning fork. The electrical circuit may include a crystal contact, piezo-electric resonator, neon lamps, or pointolite lamp. The latitude of working conditions is narrow, but the difference in natural frequency between the fork and the controlled circuit may be very considerable. Dr. W. H. Eccles said that the most interesting feature of the circuits was one which it was difficult to demonstrate effectively to an audience, namely, the ability of the fork to impose its frequency on circuits of widely different natural frequency. The voltage-time curve in a neon lamp, arranged in association with a condenser to give intermittent illumination, tapered off in the neighbourhood of the cut-off, and the voltage decrements due to the fork were consequently able to introduce considerable changes into the time of discharge of the condenser. The meeting adjourned to the Royal School of Mines, where a demonstration of "Some Effects of Alternating Magnetism with some Possible Applications" was given by Mr. W. M. Mordey, M.I.E.E.

### Carnegie Hero Awards.

The Carnegie Hero Fund Trustees at their last meeting made the following awards: John Frew, Main Street, Dreghorn, on February 29th, 1928, sustained serious injury while endeavouring to rescue several people who were in danger of electrocution, and Mrs. Jeannie McClymont Bell, Dreghorn, was slightly injured in a similar attempt. Rescue efforts were also made by William McKillop, colliery electrical machine man contractor, Dreghorn, and by John McCrindle, colliery machineman, Dreghorn. Two of the persons being rescued lost their lives. Frew had to have four fingers of his left hand, and later the whole of the arm amputated, and Mrs. Bell for some time suffered from slight paralysis. Frew was awarded an honorary certificate and an allowance at the rate of 15s. per week. Mrs. Bell also was awarded an honorary certificate and a sum of £25, while McKillop and McCrindle were granted silver watches.

### Extensions at Bradford.

On June 5th, Aldermen Wilfred Turner and J. W. Longley, chairman and deputy chairman of the Bradford Corporation Electricity Committee, respectively, each laid a foundation stone in connection with extensions at the Valley Road generating station, involving a cost of £300,000. Provision is being made for the installation of an additional 25,000-kW turbo-generator set and a high-pressure boiler; the latter, which will operate at 1,100 lb. per sq. in., will, it is claimed, be the third largest set of its kind in the world, and actually the largest in Europe. The new building will add 115½ ft. to the frontage of the power station, and will lengthen the engine room to 350 ft., thereby providing accommodation for approximately 150,000 h.p., as compared with 10,000 h.p. for which the engine room was originally designed. It is claimed that with the addition Valley Road will be the largest power station in Yorkshire. Alderman Turner, addressing the gathering at tea after the ceremony, said that during the past 25 years the Department's income had increased eight-fold, and that there had been a similar increase in the number of units sold. Alderman Longley remarked that the new high-pressure steam plant would improve the efficiency of the station to such an extent that it would place the works well ahead of any other station in the country. He mentioned that the whole of the extensions at Valley Road since the municipal electricity works was established had been carried out on specifications by the Department's own staff. Mr. Thos. Roles, M.I.E.E., city electrical engineer, said there were two good reasons for the desirability of the extensions—first, if Bradford became a selected station under the Government's "grid" scheme, the cost at which electricity would be supplied to Bradford could not be more than the generating cost; secondly, the large amount of revenue which the Corporation derived in rates from the electricity department would be increased rather than wiped out—as would happen if a non-progressive policy brought about the closing of the Valley Road station. Mr. Roles expressed disappointment that the Electricity Commissioners had regarded the site of the new Leeds municipal station at Kirkstall as better for a super-station than at Esholt, suggested by Bradford Corporation.

### The New L.E.E. Headquarters.

The new headquarters of the 27th A.A. Battalion, R.E.(T.) (London Electrical Engineers), Rochester Row, S.W.1, is to be formally opened by the Duke of York on June 26th.

### Appointments Vacant.

Electrical mechanic for the Harris Institute Engineering Department, Preston. District mains engineer for the Aylesbury Corporation Electricity Department. Telegraph foreman (£400) for the Government of Nigeria Railway Construction Department. Assistant electrician for the Three Counties Hospital, Arlesey. Hiring sales superintendent (£250+) for the Darlington Borough Council Electricity Department. Lecturer in electrical engineering for the Forest of Dean Mining School, Cinderford. Two clerks (£193) for the Battersea Borough Council Electricity Department. (See our advertisement pages to-day.)

## Institution Notes.

### Institution of Electrical Engineers.

LONDON STUDENTS' SECTION.—The summer meeting of the Students' Section will be held in Holland and Western Germany; the party will leave London on Saturday evening, July 28th, for Rotterdam, where two days will be spent. Visits have been arranged to works at Rotterdam, Eindhoven and Utrecht, and a pleasure trip to The Hague. In Germany visits have been arranged to works of engineering interest at Essen, Düsseldorf, and Cologne. The party will return from Cologne on the evening of August 6th, arriving in London on August 7th. The visits arranged include cable works, switchgear works, a power station, Philips' Lamp Works, Krupp's works, Felten & Guilleaume's works at Cologne, and if possible a visit will be arranged to the Cologne broadcasting station. The cost of the tour (for those travelling from and back to London) will be about £15 per head.

### Association of Consulting Engineers (Inc.).

At the annual general meeting of the Association, held at St. Stephen's Club on May 23rd, the chairman, Mr. S. B. Donkin, M.I.E.E., presented the report of the Committee for the year ended April 30th last. The year had been one of satisfactory work on behalf of the members and their professional interests. Nine new members had been enrolled, and three more were under consideration at that time. It was unfortunate that in some cases a want of proper co-operation between architects and engineers existed on building works. The Committee had tried to arrange a conference with the R.I.B.A., but the idea had been turned down. It was pointed out that the Federation of Civil Engineering Contractors had agreed to consider a set of standard conditions of contract to be drawn up by the Committee, and it was hoped that a satisfactory agreement would be reached. The Committee had spent a great deal of time in compiling a classified list of members, which would be attended to during the coming session. During the year discussion with the Department of Overseas Trade had taken place as to the best means of securing for English consulting engineers a fair share of work in the overseas Dominions. As a result of these negotiations the Association had been asked to nominate a member for engineering work abroad. The expenditure for the year was more than usual, but there was a balance of £16 on the right side.

# Our Personal Column.

**Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.**

The Darlington Town Council last week considered a recommendation of the Electricity Committee to the effect that no alteration be made in the present system of paying the engineer, Mr. J. R. P. LUNN, a salary and commission. The recommendation was carried with only two dissentients. In the course of the discussion one speaker said that if the system went on a standard would be set up which the Council could not afford to maintain. Mr. Lunn's remuneration last year was £1,700 (£800 salary and £900 commission). Another Councillor said that the commission basis was hardly a fair one. Alderman Bates said that over a period of seven or eight years Mr. Lunn had only received an average of £1,473. Alderman Sir Charles Starmer, chairman of the Electricity Committee, said that their Electricity Department had the lowest costs and selling prices in the country, and it was upon these results that Mr. Lunn was paid.

At Glasgow Corporation meeting on June 7th the recommendation of the Electricity Committee that Mr. HERBERT BELL, city electrical engineer, Hull, should be appointed manager, came up for confirmation, but owing to the adjournment of the meeting before the business was completed no decision was arrived at. Two members of the Committee, it appeared from the minutes, favoured the selection of another candidate, while five members voted for further consideration. The majority of the Committee, however, supported the choice of Mr. Bell. The recommendation will come before the next meeting.

The Glasgow Corporation Special Committee on Superannuation has agreed to affirm the recommendation that Mr. R. B. MITCHELL (age 56, service 30 years, average salary £1,529 per annum) be granted a superannuation allowance at the rate of £764 per annum.

The Glasgow Corporation Cleansing Committee has recommended that Mr. W. M. SELVEY, consulting engineer in connection with the disposal of the current to be generated at the new destructor works at Govan, be paid £450 as an inclusive fee in respect of his services to the department.

The Hull City Council has appointed Mr. C. I. SHUTTLEWORTH as deputy city electrical engineer. Mr. Shuttleworth's connection with the Hull Corporation dates from 1900, when he was appointed charge engineer. He has since filled the positions of sub-station superintendent and distribution engineer.

The marriage has taken place at Amberley, Glos., of Mr. MAURICE L. GORHAM, who holds an appointment at Birmingham with Callender's Cable and Construction Co., Ltd., and Miss HILDA L. HOUSE, of Amberley. The bridegroom received an oak clock from the contract staff of Callender's Company, and the mains department of the Birmingham Corporation.

Mr. JOHN HALL, B.Sc.(Lond.), A.M.I.E.E., for a number of years with the Engineers' Department, Fire Brigade Headquarters, London County Council, and later with the Electrical Research Department of the Air Ministry, is now practising as a consulting engineer at 27, Queen Victoria Street, E.C.4.

The Albert Medal of the Royal Society of Arts has been awarded to Sir ERNEST RUTHERFORD, O.M., for his pioneer researches into the structure of matter.

Mr. J. W. D. COOK, A.M.Inst.C.E., of Aylesbury Electricity Department, has been appointed technical assistant at the Nuneaton Electricity Department.

Birkenhead Corporation has appointed Mr. HARRY SOUTHALL, of Stockport, as chief clerk in the Electricity Department at £320 per annum.

The post of superintendent engineer for the North-Eastern District of the Post Office, at Leeds, rendered vacant by the retirement of Mr. T. B. JOHNSON, has been filled by the appointment of Mr. J. W. ATKINSON, of the London district. Mr. Johnson was entertained by the staff to a farewell dinner on June 6th and received a presentation.

The Canterbury City Council, on June 6th, received a recommendation from the Lighting Committee that the salary of the electrical engineer (Mr. C. A. BLASCHECK) be according to the scale laid down by the A.M.E.E., and that, in addition, he be given an allowance of £30 a year, with the right to take one instead of two pupils. It was stated by the Mayor that by the recommendation the salary would be £760 a year. Six years ago the salary was £670, and the engineer was allowed to receive two pupils, which brought him in another £100 a year. Now it was very difficult to obtain pupils owing to the unsettled conditions of electricity undertakings. Eventually the recommendation was referred back to the Committee.

Mr. E. KENT, mains assistant at Watford, has obtained an appointment in the Singapore municipal undertaking. The Watford Electricity Committee has appointed Mr. A. WEBB, of Stoke-on-Trent, as commercial assistant at £425 per annum.

Mr. DONALD S. MUNRO has been nominated for the position of chairman of the Scottish Centre of the Institution of Electrical Engineers for the ensuing year.

Mr. A. HUGH SEABROOK, of Messrs. A. Hugh Seabrook and Partners, consulting engineers, has been elected a director of Dominion Non-Metallics, Ltd.

**Obituary.**—M. A. BOUCHAYER.—The death recently took place, in Grenoble, France, of M. Aimé Bouchayer, of the Société des Etablissements Bouchayer and Viallet of that town. The deceased was one of the pioneers of hydro-electric development in the French Alps.

ALD. H. FENTUM PHILLIPS.—The death occurred on June 2nd, at the age of 56 years, of Ald. H. Fentum Phillips, A.M.I.E.E., who was the first electrical engineer at Guildford, and established the business of H. Fentum Phillips & Co., of North Street, from which he retired nearly two years ago. He served his apprenticeship as an electrical engineer with Messrs. Woodhouse & Rawson, of London, and soon after completing his indentures he established the Guildford electrical works in North Street.

# Financial Section.

**New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies Dividend Results, Transactions in Stocks and Shares.**

## New Companies Registered.

**E. & W. Shepherdson, Ltd.**—Private company. Registered June 2nd. Capital, £3,000 in £1 shares. Objects: to adopt an agreement with E. and W. Shepherdson, and to carry on the business of electrical engineers and contractors as formerly carried on by them at Morecambe and Heysham, and that of manufacturers of radio component parts and accessories, &c. The first directors are:—E. Shepherdson, 39, Sefton Road, Morecambe, electrical engineer; W. Shepherdson, "Sunninghill," Longlands Lane, Heysham, electrical engineer; B. Durrans, "Almontaire," Lake Avenue, Morecambe, bookkeeper (all permanent). Secretary: B. Durrans. Registered office: 59, Euston Road, Morecambe.

**L.M.S. Electrical Co., Ltd.**—Private company. Registered June 2nd. Capital, £2,500 in 2,000 10 per cent. preference shares of £1 each and 10 000 ordinary shares of 1s. each. Objects: to carry on the business of manufacturers of and dealers in electric incandescent lamps, thermionic valves, electrical apparatus, &c. The permanent directors are:—S. L. Price, 185, Kings Avenue, Clapham Park, S.W.12; E. Carter, 12, Mansion House Chambers, 11, Queen Victoria Street, E.C.4. Registered office: 12, Mansion House Chambers, 11, Queen Victoria Street, E.C.4.

**Hodges & Dixon, Ltd.**—Private company. Registered June 2nd. Capital, £100 in £1 shares. Objects: To act as a parent company for the development of electrical undertakings and manufacture of electrical apparatus, &c. The first directors are:—F. C. Ferris, "Ivanhoe," 23, Osbaldeston Road, Stoke Newington, N.16, accountant; W. W. Owen, 113, Norbury Court Road, Norbury, S.W.16, secretary. Secretary: W. W. Owen. Registered office: 218, Upper Thames Street, E.C.4.

**Woodward, Smith & Co., Ltd.**—Private company. Registered June 1st. Capital, £1,000 in £1 shares. Objects: To carry on in Burslem, Stoke-on-Trent, or elsewhere the business of electricians, mechanical engineers, manufacturers and workers of and dealers in electricity, motive power and light, factors of and dealers in wireless apparatus, &c. The first directors are:—E. W. Woodward, 25, Waterloo Road, Burslem, Stoke-on-Trent, electrical engineer; Grace James, 138, Leek Road, Milton, Staffs, engineer's secretary. Registered office: 25, Waterloo Road, Burslem.

**Stevens & Cole, Ltd.**—Private company. Registered June 6th. Capital, £500 in £1 shares. Objects: To carry on the business of wireless, cycle, &c., dealers, electricians, engineers, motor factors, &c. The subscribers (each with one share) are: L. Cole, 251D, East India Dock Road, E.14, electrician; Lydia Hunt, 91, Clarence Road, E.16, cashier. L. Cole is the first director and secretary. Registered office: 251D, East India Dock Road, Poplar, E.14.

**Johnson & Co. (Bradford), Ltd.**—Private company. Registered June 7th. Capital, £1,000 in £1 shares (500 7½ per cent. cumulative preference and 500 ordinary). Objects: To carry on the business of electrical engineers and contractors, suppliers of electricity, manufacturers of and dealers in electrical, magnetic, galvanic and other apparatus, mechanical, wireless and radio engineers, &c. The first directors are: A. Johnson, 29, Tichborne Road, Bradford, electrical engineer, H. Hirst, Wellwood Drive, Birkenshaw, nr. Bradford, accountant. Secretary: H. Hirst. Registered office: 23, Piccadilly, Bradford.

**North-East Electric Co., Ltd.**—Private company. Registered June 8th. Capital, £5,000 in £1 shares. Objects: To carry on the business of designers, manufacturers and repairers of and dealers in all kinds of electric motors and dynamos, automobile or mechanical parts, equipment, accessories, &c. The first directors are: R. Clark (chairman), 86, Boulevard de St. Cloud, Garches, France; C. W. Coapman, 25, Eastland Avenue, Rochester, New York; W. S. Ellis (managing director), 87, High Street, Notting Hill Gate, W.11. Registered office: 19, Edge Street, W.8.

**Swedish General Electric, Ltd.**—Private company. Registered June 6th. Capital, £100 in £1 shares. Objects: To carry on in the U.K. or elsewhere the business of manufacturers, producers, and sellers of electrical, mechanical, and other machines, appliances and apparatus, &c. The signatories to the memorandum of association are: H. J. Fellowes, 56, Rathcoole Gardens, Hornsey, N.8, clerk; W. C. Paske, 31, Amerland Road, Wandsworth, S.W.12, clerk. The first directors are not named. Registered office: 5, Chancery Lane, W.C.2.

**Radio Relays, Ltd.**—Private company. Registered June 6th. Capital, £2,500 in £1 shares: Objects: To carry on the business of distributors and relayers of radio television or other programmes, radio engineers and manufacturers, &c. The first directors are: T. Jones, 5, St. Hilda's Road, St. Annes-on-the Sea; J. H. Mitchell, "Ealing," 10, Kensington Road, St. Annes, C.A.; T. H. Staley, Bank House, Lytham, bank manager; S. E. Boyd, 7, St. Hilda's Road, St. Annes. Solicitor: J. Robson Byers, Lytham.

**Fairbourne Development Co., Ltd.**—Private company. Registered June 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of an electric light company in all its branches. The first directors are: A. Peacock, Junr., Ynys Faig Hall, Fairbourne, engineer; F. Wilkinson, 55, Brown Street, Manchester, C.A.

# Official Returns of Electrical Companies.

**Peerless Electrical Manufacturing Co., Ltd.**—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated May 22nd, 1928, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

**Tungstalite, Ltd.**—Capital, £3,000 in £1 shares. Return dated May 3rd, 1928. All shares taken up. £2,700 paid. £300 considered as paid. Mortgages and charges nil.

**Payne & Hornsby, Ltd.**—Capital, £5,000 in £1 shares. Return dated May 21st, 1928. All shares taken up. £5,000 considered as paid. Mortgages and charges nil.

**Eagle Wireless Supply Co., Ltd.**—Capital, £2,000 in £1 shares. Return dated December 31st, 1927 (filed April 9th, 1928). 990 shares taken up. £990 paid. Mortgages and charges nil.

**London Electric Wire Co. and Smiths, Ltd.**—Capital, £1,250,000 in 500,000 preference and 750,000 ordinary shares of £1 each. Return dated April 26th, 1928. 400,000 preference and 644,070 ordinary shares taken up. £350,035 paid on 350,000 preference and 35 ordinary shares. £694,035 considered as paid on 50,000 preference and 644,035 ordinary shares. Mortgages and charges nil.

**British Electric Transformer Co., Ltd.** — Capital, £1,000,000 in 300,000 preference and 700,000 ordinary shares of £1 each. Return dated May 1st, 1928. 300,000 preference and 325,000 ordinary shares taken up. £539,821 paid on 290,776 preference and 249,045 ordinary shares. £85,179 considered as paid on the remainder. Mortgages and charges, £20,000.

**Charing Cross Electricity Supply Co., Ltd.**—Capital, £2,450,000 in 400,000 preference, 1,110,000 ordinary, 400,000 City Undertaking preference, and 550,000 City Undertaking ordinary shares of £1 each. Return dated March 22nd, 1928. 400,000 preference, 1,036,800 ordinary, 400,000 City Undertaking preference and 550,000 City Undertaking ordinary shares taken up. £1,280,000 paid on 400,000 preference, 480,000 ordinary, and 400,000 City Undertaking preference shares. £1,106,800 considered as paid on 556,800 ordinary and 550,000 City Undertaking ordinary shares. Mortgages and charges, £1,036,111.

**Kensington and Knightsbridge Electric Lighting Co., Ltd.**—Capital, £500,000 in 400,000 ordinary shares of £1 each and 10,000 first preference and 10,000 second preference shares of £5 each. Return dated April 10th, 1928. 312,000 ordinary, 10,000 first preference and 10,000 second preference shares taken up. £179,840 paid on 79,840 ordinary, 10,000 first preference and 10,000 second preference shares. £232,160 considered as paid on 232,160 ordinary shares. Mortgages and charges, £140,000. Ditto guaranteed by this company and the Notting Hill Electric Lighting Co., Ltd., under powers of the Kensington and Notting Hill Electric Lighting Companies' Act, 1899: £200,000. Return of allotments made up to April 26th, 1928, shows a further 5,500 ordinary shares allotted as fully paid.

**Tyneside Electrical Development Co., Ltd.**—Capital, £150,000 in 75,000 preferred ordinary, 50,000 deferred ordinary, and 25,000 unclassified shares of £1 each. Return dated April 11th, 1928. 70,975 preferred ordinary and 50,000 deferred ordinary shares taken up. £95,775 paid (being £1 per share on the preferred ordinary and 10s. per share on the deferred ordinary shares, less £200 calls unpaid). Mortgages and charges nil. Return of allotments, made up to May 1st, 1928, shows a further 2,000 preferred ordinary shares allotted, payable in cash, and fully called up.

**Laurence Scott & Co., Ltd.**—Capital, £260,000 in 259,950 ordinary and 50 founders' shares of £1 each. Return dated April 18th, 1928. 230,080 ordinary and 45 founders' shares taken up. £131,775 paid on 131,730 ordinary and 45 founders' shares. £98,350 considered as paid on 98,350 ordinary shares. Mortgages and charges nil.

**Windsor Electrical Installation Co., Ltd.**—Capital, £125,000 in 50,000 ordinary, 50,000 5 per cent. first preference, and 25,000 7 per cent. second preference shares of £1 each. Return dated May 8th, 1928. 50,000 ordinary, 23,532 first preference and 25,000 second preference shares taken up, £73,532 paid. £25,000 considered as paid. Mortgages and charges, £1,200.

**Church Stretton Electric Supply Co., Ltd.** (in liquidation).—Satisfaction in full on May 17th, 1928, (*a*) of debentures authorised February 19th, 1914, and covered by trust deed of same date and a supplemental charge dated March 13th, 1917, securing £4,000, (*b*) of charge dated November 21st, 1923, securing £1,800, and (*c*) of charge dated January 29th, 1921, securing £1,550.

**Harris, Williams (Manufacturers), Ltd.**—Debenture by way of indemnity, dated May 15th, 1928, to secure all moneys not exceeding £4,000 for which the chargees may become liable under a guarantee to the Westminster Bank, Ltd., charged on the company's undertaking, and property, present and future, including uncalled capital. Holders: H. S. Sutherland, "Chislehurst," Carmel Road, Darlington; and T. Hall, 37, Groat Market, Newcastle-upon-Tyne.

**Auto-Bulbs, Ltd.**—Satisfaction in full on April 16th, 1928, of debenture dated July 19th, 1926, securing all moneys due to Barclay's Bank, Ltd.

**F. Malby & Co., Ltd.**—Debenture dated May 14th, 1928, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. J. Lloyd, Thorpe Lodge, Thorpe-le-Soken, Essex.

**Pritchett & Gold & E.P.S. Co., Ltd.**—Capital, £200,000 in 100,000 preference and 100,000 ordinary shares of £1 each. Return dated April 18th, 1928. All shares taken up. £30,394 paid on 15,233 preference and 15,161 ordinary shares, £169,606 considered as paid on 84,767 preference and 84,839 ordinary shares. Mortgages and charges, nil.

**Sherborne Electric Supply Co., Ltd.**—Capital, £15,000 in £1 shares. Return dated March 22nd, 1928. 12,031 shares taken up £12,031 paid. Mortgages and charges, nil.

**Automatic Rectifiers, Ltd.**—Debenture dated May 22nd, 1928, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. B. Ricketts, 14, Queen Anne Street, Cavendish Square, W.1.

**Mid-Cheshire Electricity Supply Co., Ltd.**—Capital, £150,000 in 68,925 ordinary, 60,525 7 per cent. cumulative preference, 10,000 5 per cent. cumulative preference, and 10,550 unclassified shares, all of £1 each. Return dated April 13th, 1928. 68,925 ordinary, 60,525 7 per cent. preference, and 10,000 5 per cent. preference shares taken up. £139,352 paid, £650 considered as paid, £98 calls in arrears. Mortgages and charges: £29,060 (6 per cent. mortgage debenture).

**Willey & Co., Ltd.**—Capital, £225,000 in 200,000 ordinary and 25,000 preference shares of £1 each. Return dated April 9th, 1928. 175,000 ordinary and 25,000 preference shares taken up. £28,572 paid, £171,428 considered as paid. Mortgages and charges, nil.

**Yorkshire (West Riding) Electric Tramways Co., Ltd.**—Capital, £600,000 in 350,000 preference and 250,000 ordinary shares of £1 each. Return dated March 14th, 1928. 231,305 preference and 204,885 ordinary shares taken up. £436,190 considered as paid. Mortgages and charges: £256,168.

**Dixon & Corbitt & R. S. Newall & Co., Ltd.**—Capital, £160,000 in £1 shares. Return dated April 12th, 1928. All shares taken up. £96,150 paid, £63,850 considered as paid. Mortgages and charges, nil.

**Thames Valley Electric Supply Co., Ltd.**—Capital, £100 in £1 shares. Return dated May 3rd, 1928. All shares taken up. £100 paid. Mortgages and charges, nil.

**Midland Electric Wire Co., Ltd.**—Capital, £5,000 in £1 shares. Return dated May 28th, 1928. All shares taken up. £5,000 paid. Mortgages and charges, nil.

**Harrow Electric Light and Power Co., Ltd.**—Capital, £50,000 in 6,667 ordinary and 3,333 preference shares of £5 each. Return dated March 1st, 1928. All shares taken up. £50,000 paid. Mortgages and charges: £25,000 debentures.

**Reading Electric Supply Co., Ltd.**—Capital, £200,000 in £1 shares Return dated May 3rd, 1928. 152,125 shares taken up. £147,775 paid, £4,350 considered as paid. Mortgages and charges: £150,000.

# City Notes.

### British Columbia Power Corporation, Ltd.

On Thursday last week this company published particulars of its constitution and objects. It was incorporated in Canada on May 19th last to acquire the outstanding preferred ordinary stock and the deferred ordinary stock and shares of the British Columbia Electric Railway Co., Ltd., and it has already contracted to purchase more than 85 per cent. of these stocks. The acquisition will give the Corporation control of the most extensive system of public services in Western Canada. It has an authorised capital consisting of 1,500,000 Class A shares (1,000,000 issued) and 1,500,000 Class B shares (1,000,000 issued) of no par value. The president of the company is the president of the B.C. Electric Railway Co., Ltd., Mr. George Kidd, and the directors are: Messrs. W. G. Murrin and A. T. Goward, vice-presidents, B.C. Electric Railway Co.; Sir Frank Barnard, K.C.M.G., director, B.C. Electric Railway Co.; Viscount Rothermere, chairman, *Daily Mail* Trust, Ltd.; Mr. A. P. Holt, director, Brazilian Traction, Light & Power Co., Ltd.; Mr. J. Davidson, deputy-chairman, B.C. Electric Railway Co.; Sir Herbert S. Holt, president, Montreal Light, Heat and Power Consolidated, and director, Shawinigan Water and Power Co.; Mr. J. H. Gundy, director, Canada Power and Paper Corporation; Mr. A. J. Nesbitt, president, Power Corporation of Canada, and director, Winnipeg Electric Co.; Mr. J. B. Woodyatt, president, Southern Canada Power Co.; Mr. W. J. Blake Wilson, director, Canadian Pacific Railway Co., Ltd.; and Mr. S. Godin, director, Hydro-Electric Bond and Share Corporation.

### Tokio Electric Light Co., Ltd.

The prospectus of this company's issue of £4,500,000 of 6 per cent. first mortgage bonds was published on Thursday last week. The issue price was 90 per cent., and as we recently stated holders of the company's existing 6 per cent. sterling bonds (£3,600,000) were offered an equivalent nominal value of the new bonds in exchange for their holdings, plus the difference between the issue price and par value—£10 per cent. —in cash. The bonds are repayable at par on June 15th,1953, but 1.6 per cent. of the total amount of the bonds is to be set aside annually for the redemption of the bonds by purchase or drawings. The prospectus showed that the company operates generating stations with a total capacity of 652,016 kW, of which 75 per cent. is hydro-electric. The net earnings for the last three years, before providing for loan interest and eliminating unusual and non-recurring items were as follows:—1925, £3,355,442; 1926, £4,445,082; and 1927, £4,836,795. The amount required for the payment of interest on the whole of the first mortgage bonds of which this issue forms a part is £1,493,043.

The demand for the new bonds was so great that the lists were closed at 9.15 a.m. on the day of issue. Applications from the holders of the company's existing 6 per cent. bonds were accepted up to 3.30 p.m. Similar success attended the New York issue, amounting to $70,000,000.

### Calcutta Tramways Co., Ltd.

The annual meeting was held on June 5th, Mr. J. G. B. Stone (chairman) presiding. In presenting the report and accounts (*vide* ELEC. REV., June 1st, p. 961) the chairman said that the increase in the receipts was due to the absence of rioting, improved trade, and lower fares. In view of the fact that electricity was now being taken in bulk from the Calcutta Electric Supply Corporation, the company's own equipment had been written off against the depreciation and reserve funds, leaving the sum of £155,393 standing to the credit of the depreciation fund. The increase of 30 per cent. in the tramway traffic bore out the company's contention that the tramways were the best means of transport for the mass of the population. They were considering the speeding-up of the services and would shortly open an extension from Russa Road to Ballygunge Station, about 1½ miles. The omnibus results were discouraging. Although they were continuing to improve the services they felt that it was impossible to organise and maintain an efficient system at the low fares now ruling. The Calcutta Advisory Committee was constituted in June last year and had been of great assistance in the local management of affairs.

### Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee of the Stock Exchange under Rule 159:—

Rangoon Electric Tramway and Supply Co., Ltd.—250,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 250,000.

Underground Electric Railways Co. of London, Ltd.—130,891 ordinary shares of £1 each fully paid, Nos. 5,352,148 to 5,483,030.

The undermentioned have been ordered to be officially quoted:—

Underground Electric Railways Co. of London, Ltd.—952 ordinary shares of £1 each fully paid, Nos. 5,351,196 to 5,352,147.

Tokio Electric Light Co., Ltd.—£4,500,000 6 per cent. 1st mortgage bonds (sterling series), issued at £90 per cent., partly paid and fully paid.

### Lisbon Electric Tramways, Ltd.

The report for the year ended December 31st last shows a reduction in the net profit from £230,826 to £161,876. A balance of £8,307 brought forward is added, making £170,183. From this £50,000 is transferred to reserve (against £100,000), £10,000 to exchange reserve, and £10,000 to the staff benefit fund. A final dividend of 3 per cent. is recommended on the ordinary shares, making 6 per cent. for the year. The dividend for the previous year was similar but in addition there was a scrip bonus of 50 per cent. A balance of £17,587 is carried forward. The reduction in revenue is attributed to the public disturbances in Lisbon in February last year. Expenditure upon track renewals showed a large increase.

### British Electric Traction Co., Ltd.

After providing for general expenses and debenture and loan interest for the year ended March 31st last, there is a balance of £179,925. As previously reported, dividends of 8 per cent. on the preferred ordinary stock and 5 per cent. on the deferred ordinary stock are being paid, leaving a surplus of £24,428. It is proposed to distribute £13,262 of this (equal to 10 per cent. on the deferred ordinary stock) to holders of that stock in the form of fully-paid £1 deferred ordinary shares convertible subsequently into deferred ordinary stock. The preference stock receives an additional 1½ per cent. (making 7½ per cent. for the year), and £474 is added to the undivided profits account, making £172,226. Meeting: June 18th.

### New Issue.

*Richard Johnson and Nephew, Ltd.*—We reported in our issue of June 1st (p. 947) that the existing private company bearing this title was to be formally liquidated and that a new public company had been formed (p. 959 of the same issue) to acquire the goodwill and certain of the assets of the company. The new company has a capital of £600,000, divided equally into 7 per cent. preference and ordinary shares, and it is reported that the assets acquired have a value of £702,000. On Tuesday last the company made a public issue of the whole of its preference capital (£300,000 in £1 shares) at par. Half of these had already been applied for.

### Perak River Hydro-Electric Power Co.

A meeting of the holders of the company's 7 per cent. participating debenture stock has been called for June 19th to consider a proposal to increase the amount of this stock by £250,000, raising the total to £1,600,000. The proceeds are required to finance the extension of the company's steam station from 5,000 kW to 18,000 kW capacity. It is stated that this will enable the company to attain a revenue-earning position in August next which will be considerably earlier than was anticipated.

### The "Underground" Group.

At a meeting on June 7th resolutions were passed providing for an alteration in the method of apportioning the Common Fund between the constituent companies. Lord Ashfield (chairman) explained that the new arrangement would result in the payment of the same rate of dividend by the four railway companies on their ordinary share capital, and would bring about uniformity and a closer financial relationship.

### Cia. Hispano-Americana de Electricidad.

A meeting has been called for June 28th to consider the directors' proposal to increase the capital from 200 to 260 million pesetas by the creation of 600,000 shares of 100 pesetas each. The present shareholders will be given preferential rights with regard to 400,000 of the new shares, and the remainder will be offered publicly.

### Ruston & Hornsby, Ltd.

The accounts for the year ended March 31st show a gross profit of £141,856, as compared with £89,196 for 1926-27. After providing for debenture interest and depreciation there is a balance of £73,097, to which is added £25,810 brought forward. A dividend of 2½ per cent. (against *nil*) is recommended on the ordinary shares, leaving £24,157 to be carried forward.

### Guest, Keen & Nettlefolds, Ltd.

The directors recommend a final ordinary dividend of 1s. per share, making 10 per cent., free of tax, for the year, as for 1926-27. Sir John Field Beale, K.B.E., has been elected chairman in succession to the late Lord Buckland, and Sir J. Gomer Berry has been appointed to the board.

### Barcelona Traction, Light and Power Co.

An interim dividend of 1 per cent. has been declared on the ordinary stock, and the usual quarterly dividend on the 7 per cent. participating preference stock. In addition the latter receives a 1 per cent. dividend in respect of participating rights.

### Quebec Power Co.

A dividend of $0.5 per share has been declared on the common shares for the quarter ending June 30th. A dividend of $1.75 was declared for the corresponding quarter of last year.

### J. G. White & Co., Ltd.

A dividend of 5 per cent. has been declared on the ordinary shares in respect of the past year.

### Calgary Power Co.

A dividend of 1¼ per cent. has been declared.

### French Companies.

The *Compagnie Générale de Télégraphie Sans Fil* records net profits of 9,209,000 fr. for 1927, as compared with 8,507,000 fr. in the preceding year. The dividend for 1926 was 50 fr. per share, and it is expected that the same distribution will be made for 1927.

The *Société d'Electrochimie, Electrométallurgie et Aciéries Electriques*, Ugines, reports net profits of 12,775,000 fr. for 1927, as compared with 9,894,000 fr. in the previous year. It is proposed to raise the dividend from 50 fr. to 60 fr. per share.

### German Company.

The *Land and Marine Cable Works Co.*, Cologne-Nippes, reports a satisfactory revival in the cable business during 1927 and the works was uniformly well occupied. The turnover increased by 80 per cent. The "extension" cable for use especially in districts which suffer from ground subsidences is stated to have been increasingly adopted in mines both in Germany and abroad. The net profits are returned at 340,000 marks against 330,000 marks in 1926, and the dividend remains at 10 per cent.

### German Loan in New York.

Last week a loan of $5,000,000 was issued in New York on behalf of the Markisches Elektricitätswerk A.G.

# Stocks and Shares.

MONDAY EVENING.

As the end of the first half of the year comes into nearer view, people begin to talk of a possibility of money growing a little stiffer, and this has its influence over prices of stocks and shares, not only in the gilt-edged market, but in the more speculative sections as well. The lull in activity, to which reference was made here last week, has not been succeeded, so far, by any fresh outbreak of animation, and Stock Exchange men are somewhat inclined to the view that the industrial boom, as such, must be regarded as over, at all events for the time being. Members of the House find their clients are favourably disposed towards consideration of stocks and shares, investment and speculative alike, that offer sound security and prospects of capital improvement respectively, but there is not that mad rush to buy anything and everything, such as occurred earlier in the year at the time when it seemed safe to buy almost with one's eyes shut, as the saying goes, by reason of the buoyancy shown by all the markets—with the exception, perhaps, of those connected with mining shares.

### New Issue Successes.

The avidity with which sound stock is nowadays taken received another illustration last week by the response accorded to the issue of Underground Electric Railways of London 5 per cent. bonds at 96. The issue was heavily over-subscribed, and the large applicants received no more than 5 per cent. of their subscription. The price opened at the comparatively high figure of 1¼ premium, yielded very little ground in spite of a considerable volume of stag selling, and then improved to 2 premium. Hard upon the heels of this came the offer of 4¼ million pounds Tokio Electric 6 per cent. bonds at 90, details of which were given in the ELECTRICAL REVIEW last week, p. 1010, and the subscription lists for which were open for less than a quarter of an hour. In this case, however, more than 75 per cent. of the loan could be applied for by holders of existing bonds, and there was no more than £900,000 left for public subscription. We are so accustomed, in these latter days, to big issues that £900,000 is regarded as no more than a bagatelle. One firm alone applied for £400,000 stock. The allotments to people who had none of the existing stock to convert were meagre. The price soon established a premium of 3¼ points.

### Cable Recoveries.

Something of a feature is provided by a substantial recovery in the prices of the Eastern Cable quartette. The shares of the associated companies—Eastern Extension, Western and Globe—together with Eastern Telegraph ordinary stock, went up abruptly after having undergone sharp depression. People who are dealing in the stocks admit that the outlook is difficult to estimate, so far as the immediate future goes, but they maintain that the ultimate result of the negotiations between the various systems, beam, wireless and cable, lies in no doubt; and that, notwithstanding possible labour opposition, an amalgamation or agreement of interests will be carried through in due course. It is this faith which has brought about the rally in the prices of cable securities. Marconis, which are a great deal more subject to speculative factors than the cable stocks are, have remained at about 65s. Canadian Marconis have been fluctuating erratically, and are lower on balance.

### More Wireless Wonders?

Senatore Marconi is said to be near the point at which it will be possible to announce success in connection with his experiments for simultaneous transmission of wireless telephony and wireless telegraphy by the beam system. Research work has been going on for a year or more, but only just lately has it become practicable to telephone to Canada. This opens up remarkable possibilities in the way of making wireless telephony practicable in linking together every place of importance in both hemispheres. The Stock Exchange market has been following these experiments with keen interest, and it is possible that part of the rise which has taken place this year in Marconi shares is due to buying on behalf of people who regard wireless telephony developments as being of even greater consequence than the agreement of interests reached between the Marconi Company and the cable undertakings.

### Richard Johnson.

A new issue which has been made this week takes the form of 300,000 7 per cent. cumulative preference shares of £1 each in Richard Johnson & Nephew, Ltd., manufacturers of iron, steel, copper, and other wires. The business was established in Manchester 145 years ago, and found its first opportunity for rapid progress through the invention of the electric telegraph. The first submarine cable, laid in 1851, was sheathed with the company's wire, and Richard Johnson & Nephew are still to-day among the chief suppliers of material for sheathing submarine cables. In addition to the preference shares which have been offered, there is a similar number of ordinary shares of £1 each, which had been subscribed in advance of the issue of the preference share prospectus.

### United River Plates.

The United River Plate Telephone Company maintains its 8 per cent. dividend, tax free, on the old ordinary shares, and recommends the payment of 5 per cent., tax free, on the new. The company's profits rose last year to £2,539,800, a substantial improvement over the previous year's figures. Business is going ahead so rapidly as to necessitate provision of further capital; and, while no issue is expected to be made in the near future, the directors are seeking powers to increase the capital by £1,000,000—namely, from seven to eight million pounds. The price of the shares is ¼ better at 11¼, there being some expectation that when the new shares are offered, it will be on terms that involve a bonus.

### London Railways and Trams.

The rush to subscribe for the new Underground Electric Railways of London's new issue possibly led to some little selling of the company's other stocks in order to provide money for the newcomer. This may account for a fall of a point in Underground Electric income bonds, and of 6d. in the shares. Districts are down to 75½, though Metropolitans hold their substantial improvement gained a week ago. Central London assented ordinary stock continues to advance, being another point up, in consequence of public appreciation of the relative cheapness of the stock as compared with some of the others in its group, notably Districts. In the London traction list, London and Suburban preference have fallen 1s., to 9s. 6d.; London United Tramway debenture keeps steady at 62½.

### Slump in Utilities.

Mexican Light & Power Company common shares have had a severe shake-out by reason of a reported failure in Brussels. This led to a general drop in the stocks and shares of the utility group as a whole, and brought down Hydro-Electrics to 67, and International Holdings to 300. The slump in prices is due to a fear lest there should be pressure to sell some of the shares which of late have been so popular in Belgium. Brazilian Tractions are 5 down at 54½. The preferred fell to 190. While securities connected with Brussels have been weak, New York has lent no support: in fact, it seems to be fairly obvious that American speculation has outrun the constable, as we say over here, and that a good deal of inflation has occurred, fanned by mere speculation. On this side, fortunately, the speculative fever has not flared too furiously for its financing to present any feature of grave difficulty.

### Electric Supply and Power.

Electric Supply Corporations continue strong, showing another 2s. 6d. rise at 57s. 6d. on talk, mentioned here previously, that American interests are trying to buy up the company on the basis of a higher figure than exists at present for its shares. Some of the estimates, made when the shares stood at 50s., mentioned £5 as a possible goal. Clyde Valley shares are good at 39s. Bournemouth and Poole rose to 58s. 9d., and Newcastle-on-Tyne preference are better at 26s. 6d. It will be noticed that we have included in our price list this week the ordinary shares of the Midland Electric Corporation for Power Distribution, and also the ordinary shares of the Scottish Power Company. It must be pointed out in connection with the former that the price went ex rights a few days ago, when the company distributed a share-for-share bonus, which had the effect, of course, of halving the previous quotation. As it will be impossible to calculate what the next dividend is likely to be on the doubled share capital, we omit from the last column the yield on the shares. Scottish Power shares at 31s. give a return of £5 3s. 3d. on the money, taking 8 per cent., the last dividend, as the basis of calculation. No changes of importance have occurred in the London Electric Lighting group. Scope for increased electricity supply was indicated last week by Sir John Gatti, in connection with the refrigerators that are likely to become more popular in view of the operation of the Pure Food Act. Whitehall Electric 7½ per cent. strengthened to 23s. 7½d. It is expected that the forthcoming report and accounts will make a good showing.

### High Yields Wanted.

Anglo-Argentine Tramways preferences, of both classes, are better upon attention being directed to the returns which the shares offer. There is an ever-growing pressure of demand for high-yielding investments on behalf of many trust and finance companies that have been formed in comparatively recent years, and whose portfolios are not so well stocked with good shares, acquired at low prices, as are those of the senior trust companies. Perak River Hydro-Electrics have risen to 18s., and the 7 per cent. participating debenture is firm at 110½. The company proposes to add a further quarter of a million to the existing £1,350,000 (nominal) 7 per cent. participating debenture stock. The new issue will rank *pari passu* with the existing stock.

### "Dollar" Stocks.

American Telephone and Telegraph is 7 points down. International Telephone drooped to 182½. Montreal Light, Heat and Power at 107, and Calgary Power at 117½ have both given way in sympathy with the slump that overtook Hydro-Electrics and their group.

### Miscellaneous.

Enfield Cables ordinary shares are easier at 4⅜, and Electric Constructions weakened to 27s. 6d. Siemens are 6d. down. As a whole, the manufacturing and equipment list is quiet, business being of the bread-and-butter order. Iron and steel shares keep steady. The rubber share market attracts little attention in spite of the steady shrinkage in the amount of landings as compared with deliveries. The public go to work cautiously with rubber shares, by reason of the uncertainty felt in regard to what may happen to the price of rubber when restriction is entirely withdrawn at the beginning of next November.

# Share List of Electrical Companies.

| | Nom. | Dividend. 1926. | Dividend. 1927. | Price June 11, 1928. | Rise or fall. | Yield. p.c. |
|---|---|---|---|---|---|---|
| **Home Electricity Companies.** | | | | | | |
| Bournemouth and Poole ... ... | £1 | 14† | 15½ | 29/6 | +⅛ | ... ... |
| Brompton Ordinary ... ... ... | £1 | 8¾ | 8½ | 25/6 | — | 5 9 10 |
| Charing Cross Ordinary ... ... | £1 | 8½ | 8½ | 27/- | — | 5 3 8 |
| do. do. 4½% Pref. ... | £1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Chelsea ... ... ... ... ... | £1 | 8¾ | 8¾ | 26/6 | — | 5 5 8 |
| City of London ... ... ... | £1 | 10 | 10 | 30/9 | — | 4 11 1 |
| do. do. 6% Pref. ... ... | £1 | 6 | 6 | 23/- | — | 5 4 4 |
| Clyde Valley ... ... ... ... | £1 | 8 | 8 | 39/- | +1/6 | 4 2 1 |
| County of London ... ... ... | £1 | 7½ | 7½ | 39/- | — | 3 17 0 |
| do. do. 6% Pref. ... | £1 | 6 | 6 | 23/- | — | 5 4 4 |
| Edmundsons' 7% Pref. ... ... | £1 | 7 | 7 | 25/6 | — | 5 9 10 |
| Elec. Supply Corporation ... ... | £1 | 11 | 11 | 57/6 | +⅛ | 3 16 5 |
| Kensington Ordinary ... ... | £1 | 8 | 8 | 26/6 | — | 5 5 8 |
| Lancs. Light and Power ... ... | £1 | 7½ | 7½ | 29/- | —6d. | 5 3 5 |
| London Electric ... ... ... | £1 | 8½ | 8½ | 26/6 | — | 5 5 10 |
| do. do. 6% Pref. ... ... | £5 | 6 | 6 | 5½ | — | 5 8 2 |
| Metropolitan ... ... ... ... | £1 | 8 | 9 | 25 | — | 3 15 9 |
| do. 4½% Pref. ... ... | £1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Midland Counties ... ... ... | £1 | 6 | 6½ | 30/- | — | 4 6 8 |
| Mid. Elec. Power ... ... ... | £1 | — | 15 | 38/9xb | — | ... ... |
| Newcastle-on-Tyne Ordinary ... | £1 | 5 | 6 | 27/6 | — | 4 6 8 |
| do. 7% Pref. ... | £1 | 7 | 7 | 26/6 | +6d. | 5 5 8 |
| Notting Hill 6% Pref. ... ... | £10 | 6 | 6 | 102 | — | 5 11 7 |
| North Met. Elec. 6% Pref. ... | £1 | 6 | 6 | 23/- | — | 5 4 4 |
| St. James' and Pall Mall ... ... | £5 | 8 | 8 | 27/- | — | 5 8 8 |
| Scottish Power ... ... ... | £1 | 8 | 8 | 31/- | — | 5 3 3 |
| South London ... ... ... ... | £1 | 8½ | 8½ | 26/6 | — | 5 5 8 |
| South Metropolitan Pref. ... ... | £1 | 7 | 7 | 1¼ | — | 6 3 0 |
| Urban Ordinary ... ... ... | £1 | 7 | 7 | 51/3 | — | 2 14 7 |
| Westminster Ordinary ... ... | £1 | 8½ | 8½ | 27/- | — | 5 3 8 |
| Whitehall Elec. Invst. 7½% Pref. ... | £1 | 7½ | 7½ | 23.7½ | +4½d. | 6 6 10 |
| Yorkshire Elec. ... ... ... | £1 | 8 | 8 | 33/6 | +6d. | 4 15 7 |
| **Home Rails.** | | | | | | |
| Central London Ord. Assented ... | Stock | 4 | 4 | 73 | +1 | 5 9 7 |
| Metropolitan ... ... ... ... | ,, | 8 | 8 | 71 | — | 4 4 6 |
| do. District ... ... | ,, | 8½ | 4 | 75½ | —½ | 5 6 0 |
| Underground Electric ... ... | £1 | 1½ | 5 | 26/6 | —6d. | 3 15 6 |
| do. do. Income ... | Bonds | 6 | 6 | 127 | —1 | 4 13 9 |
| **Telegraphs and Telephones.** | | | | | | |
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 100½ | — | 5 19 5 |
| do Def. ... ... | ,, | 1½ | 1½ | 24¼ | — | 6 3 9 |
| Automatic Telephone ... ... | £1 | 10 | 10 | 45/- | — | 4 9 0 |
| Eastern Extension ... ... ... | £10 | 10 | 10 | 22 | +1¼ | *4 11 0 |
| Eastern Tel. Ord. ... ... ... | Stock | 10 | 10 | 220 | +10 | *4 11 0 |
| Globe Tel. and T. Ord. ... ... | £10 | 10 | 10 | 22 | +1 | *4 11 0 |
| do. do. Pref. ... ... | £10 | 6 | 6 | 11 | — | 5 9 1 |
| Great Northern Tel. ... ... | £10 | 20 | 20 | 39 | — | 5 2 7 |
| Indo-European ... ... ... | £5 | 10 | 10 | 42½ | — | *5 17 8 |
| Marconi ... ... ... ... ... | 10/- | 5 | — | 65/- | +1/16 | 0 15 4 |
| Marconi-Marine ... ... ... | £1 | 8¾ | 12½ | 2 7/16 | — | 5 2 6 |
| Oriental Telephone Ord. ... ... | £1 | 12 | 12 | 59/6 | — | *4 9 3 |
| United R. Plate Tel. ... ... ... | £5 | 8 | 8 | 11½ | +⅛ | *3 11 2 |
| Western Telegraph ... ... ... | £10 | 10 | 10 | 21¼ | +1 | 4 12 0 |
| **Home and Foreign Trams, &c.** | | | | | | |
| Anglo-Arg. Trams First Pref. ... | £5 | 5½ | 5½ | 8½ | +⅛ | 7 0 8 |
| do. do. 2nd Pref. ... | £5 | 6 | 6 | 8⅝ | +1/16 | 7 14 10 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 76½ | — | 6 11 2 |
| British Electric Traction Def. Ord. | ,, | — | — | 530 | — | ... ... |
| do. do. 8% Pref. Ord. | ,, | 8 | 7½ | 194½ | — | 6 8 6 |
| Brazil Traction ... ... ... | £100 | 6 | 7 | 54½ | —5 | 3 4 3 |
| Brit. Columbia Elec. Rly. Pcc. ... | Stock | 5 | 5 | 95½ | +1 | 5 4 9 |
| do. do. Preferred ... | ,, | 6½ | 6½ | 208 | — | *3 6 9 |
| do. do. Deferred ... | ,, | 8 | 8 | 307 | — | *3 12 1 |
| London & Sub. Trac. 5% Pref. ... | £1 | Nil | Nil | 9/8 | — | ... ... |
| London United Tram Deb. ... | Stock | 4 | 4 | 62½ | — | 6 8 0 |
| Mexico Trams, 5% Bonds ... ... | — | 5 | 5 | 87½ | — | 5 14 8 |
| Mexican Light Common ... ... | £100 | Nil | Nil | 77 | —5½ | ... ... |
| do. 7% Pref. ... ... | £100 | Nil | 7 | 79 | —2 | 8 17 2 |
| do. 1st Bonds ... ... | — | 5 | 5 | 82½ | —1 | 6 1 3 |
| Yorkshire (West Riding) ... ... | £1 | Nil | Nil | 7/6 | — | ... ... |
| **Manufacturing Companies.** | | | | | | |
| Babcock & Wilcox ... ... ... | £1 | 13 | 15 | 67/6 | — | *4 9 0 |
| British Aluminium Ord. ... ... | £1 | 10 | 10 | 47/- | — | *4 5 1 |
| British Elec. Transformer Pref. ... | £1 | 7 | 7 | 18/- | — | 7 15 7 |
| British Insulated Ord. ... ... | £1 | 15 | 15 | 4⅜ | — | 3 12 0 |
| Brush Ord. ... ... ... ... | £1 | 10 | 10 | 22/9 | — | 6 19 0 |
| Callenders ... ... ... ... | £1 | 15 | — | 4½ | — | 3 10 9 |
| do. 6½% Pref. ... ... | £1 | 6½ | 6½ | 23/- | — | 5 9 5 |
| Crompton Parkinson Pref. Ord. ... | £1 | — | — | 17/6 | — | ... ... |
| do. 8% Pref. ... ... | £1 | — | 8 | 25/- | — | 6 8 0 |
| Edison-Swan ... ... ... ... | £/- | 10 | 10 | 12/6 | — | 8 4 0 |
| do. 5% Deb. ... ... | Stock | 5 | 5 | 90 | — | 5 11 0 |
| Electric Construction ... ... | £1 | 7½ | — | 27/6 | —3/9 | 5 9 1 |
| Enfield Cable Pref. ... ... | £1 | 7½ | 7½ | 26/3 | — | 5 14 3 |
| English Electric ... ... ... | £1 | Nil | Nil | 8/9 | — | ... ... |
| do. do. Pref. ... ... | £1 | 8 | Nil | 11/3 | — | ... ... |
| Gen. Elec. Pref. ... ... ... | £1 | 6½ | 6½ | 25/- | — | 5 4 4 |
| do. Ord. ... ... ... | £1 | 7½ | — | 38/- | — | 3 19 0 |
| Henley ... ... ... ... ... | £1 | 25 | — | 5½ | — | 4 3 4 |
| do. 4½% Pref. ... ... ... | £5 | 4½ | 4½ | 4½ | — | 5 6 0 |
| India-Rubber ... ... ... ... | £1 | Nil | Nil | 13/9 | — | ... ... |
| Johnson & Phillips ... ... ... | £1 | 12½ | 10 | 43/9 | — | 4 11 4 |
| Met.-Vickers Ord. ... ... ... | £1 | 8 | 6 | 1 3/16 | — | 3 16 10 |
| do. Pref. ... ... ... | £2 | 8 | 8 | 2⅜ | — | 6 1 11 |
| Siemens Ord. ... ... ... ... | £1 | 7½ | 7½ | 28/3 | —6d. | 5 4 4 |
| Telegraph Construction ... ... | £2 | 10 | 10 | 26½ | — | *4 10 11 |

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

# Swiss Foreign Electrical Trade.

## Imports and Exports in 1926 and 1927.

THE following statistics, showing the import and export trade of Switzerland in electrical and allied goods in 1927 have been taken from the recently-issued official trade returns. The figures for 1926 have also been given, and notes added of any increases or decreases. The returns show the most important but not all the countries of origin or destination of the goods.

### Imports.

| | 1926. Thous. fr. | 1927. Thous. fr. | Inc. or dec. Thous. fr. |
|---|---|---|---|
| *Electrical cable, not insulated—* | | | |
| Total | 254 | 80 | − 174 |
| From Germany | 87 | 34 | − 53 |
| ,, France | 19 | 30 | + 11 |
| ,, United States | 146 | 16 | − 130 |
| *Insulated cable not lead covered or iron armoured—* | | | |
| Total | 404 | 299 | − 105 |
| From Germany | 302 | 268 | − 34 |
| ,, France | 22 | 21 | − 1 |
| ,, Italy | 4 | 2 | − 2 |
| ,, Belgium | 57 | 6 | − 51 |
| ,, Great Britain | 11 | — | − 11 |
| *Cable covered with lead—* | | | |
| Total | 389 | 60 | − 329 |
| From Germany | 388 | 60 | − 328 |
| *Cable covered with lead and iron armoured—* | | | |
| Total | 200 | 100 | − 100 |
| From Germany | 195 | 92 | − 103 |
| ,, Italy | 1 | — | − 1 |
| ,, France | 3 | — | − 3 |
| ,, Austria | — | 7 | + 7 |
| *Cable insulated with rubber or paper and covered with textiles—* | | | |
| Total | 694 | 303 | − 391 |
| From Germany | 293 | 154 | − 139 |
| ,, Italy | 32 | 4 | − 28 |
| ,, France | 19 | 19 | — |
| ,, Belgium | 101 | 9 | − 92 |
| ,, Holland | 215 | 113 | − 102 |
| ,, Great Britain | 17 | 3 | − 14 |
| *Cable ditto covered with lead—* | | | |
| Total | 520 | 357 | − 163 |
| From Germany | 201 | 275 | + 74 |
| ,, Belgium | 139 | 58 | − 81 |
| ,, Italy | 3 | — | − 3 |
| ,, Great Britain | 92 | — | − 92 |
| ,, Holland | — | 17 | + 17 |
| *Dynamo-electric machines and transformers—* | | | |
| Total | 1,957 | 2,404 | + 447 |
| From Germany | 1,011 | 1,094 | + 83 |
| ,, France | 387 | 346 | − 41 |
| ,, Italy | 92 | 264 | + 172 |
| ,, United Kingdom | 157 | 146 | − 11 |
| ,, United States | 149 | 207 | + 58 |
| ,, Belgium | 25 | 17 | − 8 |
| ,, Holland | 107 | 319 | + 212 |
| *Accumulators and batteries—* | | | |
| Total | 2,266 | 3,301 | +1,035 |
| From Germany | 837 | 1,456 | + 619 |
| ,, Italy | 86 | 62 | − 24 |
| ,, France | 496 | 437 | − 59 |
| ,, United States | 148 | 245 | + 97 |
| ,, Austria | 137 | 91 | − 46 |
| ,, United Kingdom | 410 | 850 | + 440 |
| ,, Belgium | * | 26 | — |
| *Steam engines, cranes, pumps, turbines, &c.—* | | | |
| Total | 246 | 270 | + 24 |
| From Germany | 157 | 229 | + 72 |
| ,, United Kingdom | 44 | — | − 44 |
| ,, France | 32 | — | − 32 |
| ,, United States | * | 38 | — |
| *Electric arc lamps—* | | | |
| Total (mainly from Germany) | 26 | 38 | + 12 |
| *Electric incandescent lamps, mounted—* | | | |
| Total | 2,318 | 2,448 | + 130 |
| From Germany | 613 | 629 | + 16 |
| ,, Austria | 254 | 285 | + 31 |
| ,, Holland | 1,072 | 1,112 | + 40 |
| ,, France | 139 | 106 | − 33 |
| ,, Hungary | 170 | 245 | + 75 |
| *Insulators, mounted—* | | | |
| Total | 601 | 546 | − 55 |
| From Germany | 119 | 184 | + 65 |
| ,, United States | 294 | 107 | − 187 |
| ,, Denmark | 142 | 225 | + 83 |
| *Electric meters—* | | | |
| Total | 626 | 647 | + 21 |
| From Germany | 495 | 557 | + 62 |
| ,, France | 63 | 52 | − 11 |
| *Telegraph and telephone apparatus—* | | | |
| Total | 7,035 | 5,002 | −2,033 |
| From Germany | 2,597 | 2,379 | − 218 |
| ,, United Kingdom | 351 | 352 | + 1 |
| ,, Sweden | 119 | 111 | − 8 |
| ,, France | 1,161 | 683 | − 478 |
| ,, Belgium | 2,395 | 660 | −1,735 |
| ,, United States | 180 | 203 | + 23 |
| *Electrical apparatus not elsewhere mentioned—* | | | |
| Total | 3,502 | 4,159 | + 657 |
| From Germany | 1,864 | 2,214 | + 350 |
| ,, France | 292 | 181 | − 111 |
| ,, United Kingdom | 1,007 | 1,126 | + 119 |
| ,, United States | 80 | 402 | + 322 |
| ,, Holland | 81 | 13 | − 68 |

### Exports.

| | 1926. Thous. fr. | 1927. Thous. fr. | Inc. or dec. Thous. fr. |
|---|---|---|---|
| *Dynamo-electric machines and electric Transformers of all kinds—* | | | |
| Total | 26,828 | 28,444 | +1,616 |
| To Germany | 2,165 | 2,479 | + 314 |
| ,, Austria | 580 | 357 | − 123 |
| ,, France | 2,221 | 1,638 | − 583 |
| ,, Italy | 1,817 | 1,540 | − 277 |
| ,, Belgium | 872 | 620 | − 252 |
| ,, United Kingdom | 1,243 | 853 | − 390 |
| ,, Egypt | 267 | 199 | − 68 |
| ,, Spain | 3,044 | 4,256 | +1,212 |
| ,, British India | 34 | 219 | + 185 |
| ,, Poland | 904 | 811 | − 93 |
| ,, Rumania | 755 | 900 | + 145 |
| ,, Colombia | 13 | 58 | + 45 |
| ,, Brazil | 1,374 | 1,330 | − 44 |
| ,, Argentina | 967 | 757 | − 210 |
| ,, Netherlands | 1,907 | 1,202 | − 705 |
| ,, Norway | 438 | 308 | − 130 |
| ,, Netherlands Indies | 482 | 1,030 | + 548 |
| ,, China | 231 | 411 | + 180 |
| ,, Japan | 1,544 | 2,295 | + 751 |
| ,, Peru | 162 | 476 | + 314 |
| ,, Australia | 714 | 1,116 | + 402 |
| *Accumulator batteries, electrodes in combination with rubber or celluloid—* | | | |
| Total | 374 | 254 | − 120 |
| To France | 122 | 34 | − 88 |
| ,, Italy | 10 | 24 | + 14 |
| ,, United Kingdom | 3 | 7 | + 4 |
| ,, Poland | 4 | — | − 4 |
| ,, Germany | 40 | 8 | − 32 |
| ,, Spain | 11 | * | — |
| ,, Turkey | 4 | * | — |
| ,, India | * | 6 | — |
| *Insulators, mounted—* | | | |
| Total | 167 | 129 | − 38 |
| To Germany | 7 | 4 | − 3 |
| ,, France | 5 | 7 | + 2 |
| ,, Italy | 91 | 21 | − 70 |
| ,, Spain | 19 | 11 | − 8 |
| ,, United Kingdom | 1 | 4 | + 3 |
| ,, Norway | 11 | 1 | − 10 |
| ,, Argentina | 16 | * | — |
| ,, United States | * | 50 | — |
| *Electric cable, not insulated—* | | | |
| Total | 1,455 | 2,042 | + 587 |
| To France | 847 | 815 | − 32 |
| ,, Austria | 35 | 127 | + 92 |
| ,, Italy | 35 | 117 | + 82 |
| ,, United Kingdom | 405 | 644 | + 239 |
| ,, Norway | 9 | 17 | + 8 |
| ,, Czecho-Slovakia | 84 | 113 | + 29 |
| *Cable, lead covered—* | | | |
| Total | 36 | 39 | + 3 |
| To France | * | 20 | — |
| ,, Rumania | 10 | 1 | − 9 |
| ,, Venezuela | 18 | * | — |
| ,, Spain | * | 14 | — |

* Not specified.

| | 1925. Thous. fr. | 1926. Thous. fr. | Inc. or dec. Thous. fr. |
|---|---|---|---|
| *Insulated cable, not lead covered or iron armoured—* | | | |
| Total | 900 | 697 | − 203 |
| To France | 111 | 437 | + 326 |
| ,, United Kingdom | 521 | 75 | − 446 |
| ,, India | * | 7 | — |
| ,, Austria | 11 | 21 | + 10 |
| ,, Sweden | 5 | 34 | + 29 |
| ,, Hungary | 46 | 61 | + 15 |
| ,, Egypt | 15 | 1 | − 14 |
| ,, Peru | 4 | * | — |
| *Cable, lead-covered and iron armoured—* | | | |
| Total | 8 | 26 | + 18 |
| To France | 1 | 15 | + 14 |
| ,, Straits | * | 3 | — |
| ,, China | * | 1 | — |
| ,, Germany | * | 4 | — |
| ,, Spain | 4 | * | — |
| *Cable, insulated with rubber or paper and covered with textiles—* | | | |
| Total | 201 | 696 | + 495 |
| To France | 32 | 18 | − 14 |
| ,, Belgium | 1 | 1 | — |
| ,, United Kingdom | 2 | 461 | + 459 |
| ,, Denmark | 129 | 99 | − 30 |
| ,, Poland | * | 11 | — |
| ,, India | * | 42 | — |
| *Electric locomotives—* | | | |
| Total | 2,354 | 2,216 | − 138 |
| To United Kingdom | 50 | 19 | − 31 |
| ,, South Africa | 620 | — | − 620 |
| ,, Japan | 387 | — | − 387 |
| ,, France | 3 | 1 | − 2 |
| ,, Venezuela | 445 | 130 | − 315 |
| ,, Chile | 848 | 1 | − 847 |
| ,, Spain | * | 1 623 | — |
| ,, India | * | 403 | — |
| *Telegraph and telephone apparatus—* | | | |
| Total | 640 | 959 | + 319 |
| To France | 156 | 120 | − 36 |
| ,, Italy | 80 | 143 | + 63 |
| ,, Germany | 52 | 144 | + 92 |
| ,, Spain | 11 | 3 | − 8 |
| ,, Greece | 48 | 6 | − 32 |
| ,, United Kingdom | 23 | 77 | + 54 |
| ,, Belgium | 74 | 51 | − 23 |
| ,, Egypt | 38 | 10 | − 28 |
| *Cables, ditto, covered with lead—* | | | |
| Total | — | 32 | + 32 |
| To Spain | * | 27 | — |
| *Electric incandescent lamps, mounted—* | | | |
| Total | 1,464 | 2,994 | +1,530 |
| To Austria | — | 540 | + 540 |
| ,, France | 1,120 | 298 | − 832 |
| ,, Italy | 269 | 720 | + 451 |
| ,, Portugal | 10 | 13 | + 3 |
| ,, Germany | 5 | 18 | + 13 |
| ,, Norway | 4 | 4 | — |
| ,, Algeria | 17 | 11 | − 6 |
| ,, United Kingdom | 13 | 28 | + 15 |
| ,, Holland | * | 847 | — |
| *Steam engines, cranes, pumps, turbines, &c.—* | | | |
| Total | 17,729 | 14.535 | −3,194 |
| To Germany | 558 | 835 | + 277 |
| ,, France | 2,078 | 2,157 | + 79 |
| ,, Belgium | 1,163 | 997 | − 166 |
| ,, Holland | 1,419 | 544 | − 875 |
| ,, British India | 120 | 210 | + 90 |
| ,, Japan | 2,850 | 1,741 | −1,109 |
| ,, United Kingdom | 1,739 | 931 | − 808 |
| ,, Spain | 204 | 934 | + 730 |
| ,, China | 456 | 135 | − 321 |
| ,, Argentina | 1,829 | 262 | −1,567 |
| ,, Egypt | 123 | 26 | − 97 |
| ,, Rumania | 322 | 166 | − 156 |
| ,, Russia | * | 175 | — |
| ,, Portugal | 160 | 205 | + 45 |
| ,, Colombia | 3 | 68 | + 65 |
| ,, Chile | 49 | * | — |
| *Electric meters—* | | | |
| Total | 10,543 | 13,215 | +2,672 |
| To Germany | 389 | 748 | + 359 |
| ,, Austria | 288 | 483 | + 195 |
| ,, France | 1,579 | 1,963 | + 384 |
| ,, Italy | 1,183 | 642 | − 541 |
| ,, United Kingdom | 1.270 | 1,648 | + 378 |
| ,, Belgium | 1,227 | 1,266 | + 39 |
| *Electric meters—(cont.)* | | | |
| ,, Spain | 700 | 1,039 | + 339 |
| ,, Japan | 212 | 456 | + 244 |
| ,, Netherlands | 472 | 603 | + 131 |
| ,, Czecho-Slovakia | 779 | 1,049 | + 270 |
| ,, Australia | 421 | 288 | − 133 |
| ,, United States | 501 | 756 | + 255 |
| *Electrical apparatus not elsewhere mentioned—* | | | |
| Total | 12,462 | 14,321 | +1,859 |
| To Germany | 674 | 1,067 | + 393 |
| ,, Austria | 938 | 516 | − 422 |
| ,, France | 1,693 | 1,488 | − 205 |
| ,, Italy | 669 | 573 | − 96 |
| ,, Belgium | 1,327 | 1,380 | + 53 |
| ,, Netherlands | 591 | 675 | + 84 |
| ,, United Kingdom | 516 | 749 | + 233 |
| ,, Spain | 1,493 | 2,159 | + 666 |
| ,, Portugal | 187 | 275 | + 88 |
| ,, Norway | 120 | 119 | − 1 |
| ,, Czecho-Slovakia | 818 | 721 | − 97 |
| ,, Egypt | 183 | 232 | + 49 |
| ,, China | 61 | 82 | + 21 |
| ,, Japan | 181 | 411 | + 230 |
| ,, United States | 886 | 1,364 | + 478 |
| ,, Argentina | 477 | 400 | − 77 |
| ,, Peru | 112 | 105 | − 7 |
| ,, Rumania | 176 | 211 | + 35 |
| ,, Poland | 258 | 224 | − 34 |

* Not specified.

# Economic Conditions in Holland.

### British Commercial Secretary's Report.

MR. R. V. LAMING, O.B.E., British Commercial Secretary at The Hague, has forwarded to the Department of Overseas Trade a report upon economic conditions in the Netherlands during 1927 (Stationery Office, 3s. net). While this contains very little of direct electrical interest, Mr. Laming deals with several matters which have a bearing upon trade with the country. He says that Holland is now in a very stable condition, having surmounted post-war difficulties. With regard to labour, it is said that the 48-hour week appears to have been introduced in most industries. Fluctuations in wages are no longer violent, and although the largest federation of employers still considers the general rates too high, reductions will be very hard to effect, and then only in a very gradual manner. No labour disputes of any magnitude have been recorded, and unemployment figures also reflect the returning stability. Generally speaking, industries are flourishing, particularly those of more recent establishment such as artificial silk, electric lamp and radio apparatus manufacture.

British exports to the Netherlands and their proportion to the total have increased, while Dutch exports to Great Britain have decreased.

The large Dutch concerns, which practically have a monopoly of the production in the country, and are allied to similar concerns abroad, all appear to be prospering. One of the principal instances of this is the Philips incandescent electric lamp and radio works. This may now be considered the largest Dutch industrial undertaking; it employs nearly 12,000 hands in Holland alone. In an appendix, under the general heading of "lamps," the exports during 1927 are given as 4,365,000 kg., valued at 20,544,000 florins, of which Belgium took 1,031,000 fl., France 2,513,000 fl., Great Britain 537,000 fl., Argentina 1,402,000 fl., Austria 1,692,000 fl., and Italy 2,067,000 fl.

No efforts are being spared to promote the use of Dutch products at home. In May last year the Minister for Home Affairs issued a circular to municipalities urging them to give as many orders as possible to Dutch industries, and threatening to reduce or withhold assistance to such municipalities as did not comply with these instructions when in future they applied for financial assistance for the purpose of reducing unemployment. In the same manner it has become customary to ask for quotations for similar work (*a*) for material of Dutch origin, and (*b*) for material of foreign origin.

Some details of various industries which are given in the report show a large expansion in the use of electric power between 1921 and 1925. In the "metal" industry, for instance, while the personnel fell slightly from 1921 to 1925, the amount of electric power employed rose from 15.0 to 25.3 million kWh, while the quantities of material used showed a very similar proportional increase. There was also a slight reduction in the number of employés in the woollen textile industry, but the quantity of electricity consumed rose from 5.5 to 7.1 million kWh. The number of workers in the cotton textile industry increased, but the use of electricity advanced at a greater rate, and in 1925 was more than double the 1921 consumption.

The Government has under consideration the application of

different customs duties to goods from different countries; it is thought that this "would furnish negotiators for future commercial treaties with a weapon with which to fight the growing tendency of foreign countries to place trade barriers in the way of imports." It is apparently the intention not to counter protective tariffs by similar action, but to offer advantages for favourable treatment.

Mr. Laming says that it is gratifying to note that visits appear to be more often exchanged between British and Dutch traders than formerly, to their common advantage. The advertising of British goods is still too meagrely undertaken, and should be carefully considered by those firms which already have a foothold in the country. Although English is understood by the majority of business men, the Dutchman is susceptible with regard to his own language, and appeals to him in it are more effective. It should, however, be borne in mind that the best method is to have the advertisement drafted in the country itself. More frequent personal canvassing is advocated, as well as a thorough study of means of transport; the latter is especially important in view of the advantages possessed by Centinental competitors.

Reference is made to the development of short-wave radio communication between the Netherlands and its dependencies. Messrs. Philips's laboratories have succeeded in establishing communication with both the Dutch East and West Indies, and the Government is said to be contemplating the establishment of a service in the near future for public purposes. Messrs. Philips, in combination with banking and other concerns with large interests in the Dutch East Indies, have formed a private company to establish communication from a transmitting station which is under construction at Huizen. The Budget contains provision for the introduction of the beam system and the building of a station for this purpose. Direct radio communication is to be effected with all European countries, besides that already in existence with Denmark and Austria.

# The I.M.E.A. in the West Country.-II.

## A Report of the Proceedings and Social Functions of the Annual Convention at Bath.

ON Monday last the 33rd annual Convention of the Incorporated Municipal Electrical Association was opened at Bath; the list of members, visitors, and guests, included many ladies, showed a total of 870 persons, of whom about 250 were engineers in charge of electricity supply undertakings, and the accommodation of the hotels in Bath and the vicinity was taxed to the utmost. Headquarters was at the Grand Pump Room, where the Convention Office was opened on Monday morning, for the issue of badges, &c., and there also the President, Mr. Fredk. W. Purse, M.I.E.E., M.I.Mech.E., engineer and manager of the West Ham Electricity Department, supported by the Mayor of West Ham (Ald. Morris Streimer, J.P.), held a reception in the evening. Dancing and music were enjoyed until a late hour, and the Old Roman Bath was open during the evening for inspection, an explanatory address being given by Mr. A. J. Taylor, F.R.I.B.A.

The members settled down to serious business on Tuesday morning, assembling at the Theatre Royal, where Ald. Sir Harry Hatt, J.P., chairman of the Bath Electricity Committee, extended to them a hearty welcome on behalf of the Mayor and Corporation, explaining that owing to ill-health the Mayor (Ald. Cedric Chivers, J.P.) was compelled to reserve his energies for the reception in the evening. Mr. F. W. Purse expressed thanks to Sir Harry in the name of the Association, and afterwards delivered his presidential address, of which an abstract is given below.

After briefly reviewing the work of the I.M.E.A. and kindred associations, Mr. Purse devoted his attention to the Electricity (Supply) Act of 1926, severely criticising its provisions and maintaining that the concentration of generation in a small number of stations offered little, if any, prospect of cheapening electricity. He considered that the "base load" stations would be unduly favoured, that the case for the standardisation of frequency had not been proved, and that the drafting of the Schedules was indefinite—except in respect of rate relief, which should have been prohibited. American experience had revealed the drawbacks of long-distance transmission and interconnection; but the Act being an accomplished fact, they must do their best to co-operate with the Central Electricitly Board. Mr. Purse regarded with apprehension the activities of supply companies, backed by American capital, and regretted that the London County Council had not made better terms with the London companies. In conclusion, he emphasised the growing importance of distribution, and the necessity of increasing the sale of electricity.

At the conclusion of the address, ladies were invited to meet Mrs. Purse at the well-known Old Red House Restaurant, for coffee and refreshments, whilst a paper by Col. A. Sinclair, M.I.E.E , A.M.Inst.C.E., chairman of the Electricity Committee, Swansea, and Mr. J. W. Burr, M.I.E.E., M.I.Mech.E., chief electrical engineer, Swansea, on "The Administration of Electricity Supply Undertakings," was read and discussed. An abstract of the paper appears in our later pages.

Rotarians lunched together at the Old Red House, the rest of the members dispersing whither they would. In the afternoon they reassembled to take part in one or other of three expeditions, namely, a visit to the hot mineral springs and bathing establishment, where they were conducted through the various departments and witnessed special demonstrations of the treatments there practised; a tour of the City of Bath and the surrounding hills in motor coaches; and a visit to the model chocolate factory of Messrs. J. S. Fry & Sons, Ltd., at Somerdale, seven miles from Bath (some particulars of the electrical plant were given in our last issue).

In the evening the Mayor of Bath and the Mayoress (Madam Sarah Grand) held a reception at the Grand Pump Room, which was followed by dancing and a musical entertainment.

The programme for Wednesday comprised the reading and discussion at the Grand Pump Room of two papers: the "Distribution of Electricity in Cities and Towns," by Mr. L. Romero, M.I.E.E., borough electrical engineer of Salford, and "Distribution of Electricity in Rural Districts," by Mr. H. F. G. Woods, M.I.E.E., M.I.Mech.E., engineer and manager of the Torquay electricity supply undertaking, after which the official photograph was to be taken at the Institution Gardens. The afternoon was set aside for an official visit to the exhibition of electrical apparatus which was organised in the Assembly Rooms, the public being excluded on that afternoon. A garden party was to be given by Ald. Sir Harry Hatt, J.P., chairman of the Bath Electricity Committee, and Lady Hatt, in the Royal Victoria Park, and in the evening a special concert was arranged for.

Yesterday, Thursday, was denominated "Women's Day"—a new feature arising out of the increasing importance of the part taken by women, especially the Electrical Association for Women, in recent years in the development of the uses of electricity in the home. Again meeting at the Grand Pump Room, the members of the I.M.E.A., together with many members of the E.A.W., were to hear and discuss two papers: "Domestic Electrification: Its Development and Requirements," by Messrs. J. L. Carr, B.Sc., A.M.I.E.E., and J. D. Peattie, B.Sc., A.M.I.E.E., of the Manchester Corporation Electricity Department, and "Selling More Electricity for Domestic Purposes," by Lieut.-Col. W. A. Vignoles, D.S.O., director and secretary of the British Electrical Development Association. A "Women's Luncheon" was to be held, for which a heavy demand for tickets was experienced, and afterwards a women's visit to the electrical exhibition was to take

place, the exhibition being closed to all male visitors on that afternoon. Meanwhile the usual private meetings of the local authority committee members on the one hand, and the engineers (members of the Associated Municipal Electrical Engineers) on the other, were to be held. In the evening the annual dinner was to take place at the Grand Pump Room.

To-day the morning will be occupied by the annual general meeting of the Association at the Grand Pump Room, and in the afternoon two excursions are provided for; one party will visit the Cheddar Gorge and caves, driving over the Mendip Hills *via* Marksbury and Chewton Mendip, and returning by way of Blagdon and Chelwood, whilst another will drive to Longleat, the seat of the Marquis of Bath, and take tea at Hornings-ham, about 15 miles to the south of Bath. These trips conclude the formal arrangements, but members will have the entrée of a number of works (including those of Messrs. Stothert & Pitt, Ltd., described in our last issue) and other places of interest, on Saturday morning.

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## Presidential Address.

By FREDK. W. PURSE, M.I.E.E., M.I.Mech.E.
(Engineer and Manager, West Ham Electricity Department.)

(*Abstract.*)

It has been my duty to represent the Association at numerous functions during the past year, and one would hardly be human not to be deeply moved and feel some pride and pleasure in the high position which this Association now holds as representing the major portion of the electricity supply industry in the country.

The annual report on the work of the Council and its Committees barely does justice to the enormous amount of time and consideration given to the various subjects which come under review. The decision of the Council to limit the increase in subscriptions to the minimum required for the immediate work of the Association has resulted in the new scale being willingly accepted by the whole of the members. The labours of the Electrical Apparatus Committee and Agreements Committee have been of especial value.

I cannot overlook the important work which this Association has carried out through its representatives in connection with the various matters relating to overhead lines. It is to be regretted that it was thought necessary to form another and separate association to deal with this question. Existing associations were together carefully and thoughtfully pursuing every avenue to arrive at a satisfactory solution, and in my opinion further duplication was not only unnecessary, but likely to be a source of friction and irritation.

The work of the British Electrical and Allied Industries Research Association is carried on principally by voluntary subscriptions, which at present only reach the meagre sum of £24,000 per annum. Such an amount is totally inadequate. The results achieved by the Research Association represent a very definite financial advantage to every supply undertaking, and it is therefore the duty of each one to contribute its quota; the greater the funds at the disposal of the Association the greater the benefit we shall all obtain, and I do therefore impress upon everyone the necessity of subscribing liberally to the work.

The activities of the British Electrical Development Association, of which one of our past-presidents is now the energetic director, are known to all of you, but subscriptions from all of you are not known to the Association. We have one of the best selling commodities and yet one of the poorest selling organisations; our indefatigable honorary secretary is chairman this year of the executive committee, so let us raise the power factor of the British Electrical Development Association to unity in appreciation of all he has done for us.

The B.E.S.A. also needs ever-increasing support for its widening activities. I know the difficulty of getting sums voted for the work of these deserving Associations; would it not be better for all supply undertakings to pay their quota to them by one inclusive surcharge on the basis of total revenue or energy sold?

The aims and objects of the National Register of Electrical Installation Contractors are such as to command a greater amount of support from supply engineers than they receive at present. In this case it is moral and not financial support that is necessary, and I cannot think that those who stand aloof do so because they are indifferent as to the standard of installation work connected to their mains. The National Register can be an instrument of great usefulness and much good in obtaining and maintaining that proper class of wiring which I believe is the desire of all of us. Support and encourage registered contractors in every possible way!

I should like to give consideration to one or two aspects of the Electricity (Supply) Act, 1926. Before the Bill was presented to, and during its passage through, Parliament there was a considerable amount of window-dressing and Press propaganda making claims which went to such an absurd extent as to discount their value to those in a position to properly judge the whole facts. Marvellous figures were quoted as to the saving or reduction which the Act would effect, when, as a matter of fact, as subsequent experience is proving, at least 75 per cent. of the amount would have been effected without the Act, and it remains to be seen if the further 25 per cent. will justify the cost of effecting it.

We were told that we were backward in this country in respect to our supply industry, that our obsolete methods of local generation were responsible for high charges, and high charges were responsible for low consumption *per capita*. Nevertheless, the President of the British Electrical Development Association, in replying to the attack on the charges of certain London companies, claimed that such charges were actually lower than those in New York, and if this be true it shows that the actual charge is not a true measure of the consumption.

Then, again, great play was made of the fact that there are a large number of small generating stations that are redundant and ought to be scrapped, but I am quite certain that the 500 engineers, with all their skill and ability, each striving his utmost to lower the cost of production, have done more in the past to bring about a full supply of low-priced electricity for all who required it than will the very limited number be able to achieve in the future.

I maintain that with the wholesale reduction in the number of generating stations, and their personnel thrown on the scrap heap, with true comparisons between the remaining stations obliterated by inter-running, the element of competition will disappear, the individual will lose his individuality, size and will take the place of skill, and thermal efficiency will take the place of "dollar" efficiency.

High thermal efficiency and low coal consumption can be attained by anyone, but at a cost; generation can be concentrated at a few stations and the energy transmitted all over the country, but at a cost; the only thing that matters is what the consumer pays for an efficient and reliable supply—everything was pointing in his favour, but what is the outlook now? In the Act (except in cases of selected stations) the only guarantee is "that for a period of not less than seven years the cost is to be less than the cost per unit at which electricity is then being produced"; only for a period of seven years, only present-day cost is guaranteed, and the super-cheap units that were spoken of as being "ours for the asking" are still concealed in Acts of Parliament.

I deprecate in the strongest possible manner the way in which the electricity supply of this country—particularly municipal—has been criticised for a state of affairs for which it was not responsible; having transferred us from one state of bondage to another, I trust the politicians will now leave us alone, and let them remember that that country will succeed best which learns first how to speed up the production of industry and slow down the production of legislation.

The main feature of the Act is to provide for the interconnection of practically all supply undertakings in the country, for the eventual supersession of a large percentage of existing generating stations, and for what is now termed the "base load" being carried by a few of the largest stations.

The "base load" so provided is naturally to be diverted from the many other stations to be shut down or restricted in working, and any benefits derivable from such interconnected working ought to be shared by all those affected; unfortunately, the Act confers the largest benefit on base-load stations, which, in the main, will be the largest stations, so that their already favourable position will be made still more favourable at the expense of the smaller and less fortunately-placed undertakings. The particular provision in the Act to which I refer is that which provides that the owner of a selected station shall be supplied by the Board at the cost of production adjusted to the load factor and power factor.

Coupled with this inequitable allocation is the method set forth in the Act for the ascertainment of the average kilowatts of maximum demand, which favours base-load stations, but reacts unfavourably in other cases, as the higher the load-factor the higher will be the average maximum demand to be paid for.

On the much debated question of standardisation of frequency, the weight of opinion of those well able to judge did not support the proposals incorporated in the Act.

With regard to the question of rate relief in Schedule 5, many of us protested that the insertion of a definite amount of 1½ per cent. would be interpreted as being an obligatory contribution to the rates instead of a permissive one, and subsequent events have shown this to be the case. The view of this Association, which I entirely agree with, was that there should be no contribution to rate relief except where such amount might be a repayment of amounts previously contributed from the rates.

I cannot agree with the view that the rates are entitled to some contribution in respect of the security of the rates for loans raised for the purposes of the electricity undertaking. This argument at once puts a heavy penalty on municipal enterprise, and also overlooks the fact that the ratepayers have a very valuable security in the undertaking itself, which is being paid for and presented to them free of cost by the consumers of electricity.

In the carrying out of its schemes it is to be hoped that the Central Electricity Board will not be led to rely too much upon the "grid" for the transference of load—the gain by the reduction of spare plant is not as great as we are asked to believe; interconnection is only between the alternators,

and as there is a great deal of other plant not interconnected their value cannot be taken into consideration. Moreover, other complications arise when such a system as the "grid" is brought into operation, and we might here consider the experience of America. Let me quote from a recent issue of the *Electrical World*. I find the following:—

"Long-distance transmission is *growing* more reliable."

"Load dispatching becomes more difficult and complicated with the growth of systems."

"For successful parallel operation and to secure the proper load division between interconnected generating stations and systems, it is essential that the frequency be very closely controlled."

"Voltage control grows more important and more complicated as larger systems are tied together and as additional interconnections are made."

"A great need exists for a system of relaying which while selective, will instantly disconnect a faulty circuit."

"Transmission lines still constitute the weakest link in the chain between generating stations and customer."

"Some problems require solution before an interconnected group may realise the advantages sought. These problems relate, chiefly, to the ability to control the division of energy between neighbouring stations and to make delivery continuously when occasion requires."

Apart from these difficulties of operation there is the trouble from lightning, and from the records of one American system I find that interruptions from this source on its 132,000-volt line have reached as high a figure as 36 per 100 miles of circuit per year.

Finally, there is the trouble from aviation, in peace time as much as in war time. I quote the following from the *Electrical World* of January 28th this year:—

"Among the many dangers of a forced landing at night is the possibility that the descent may end by a collision with one of the electric transmission lines which are spreading over the whole country. Near and around many flying fields this danger is now guarded against by placing red lights on a sufficient number of the poles to indicate the location of the line. It is not now practicable thus to indicate the positions and routes of transmission lines throughout their whole lengths, but such precautions are being asked for, and it is certain that the future will see not only a great increase in the number of such requests, but probably also the substitution of demands in the place of requests. Already one large interconnected system has been asked so to indicate some of its lines along travelled air lanes."

Is it to be wondered at, therefore, that many of us have raised questions as to the future when our control of production is to be taken away and replaced by a supply for which no binding guarantee is given that its future cost and continuity will be better than those which it replaces? Still, the Act has been inflicted upon us by Parliament, and it is up to all of us to help the Central Board to make the best of it, as it, too, has its own difficulties. We must work together in sympathy and co-operation; goodwill, forbearance, and a fair and square deal will produce better results than any Act of Parliament.

One other matter which we of the municipalities are concerned with is the land-grabbing policy of supply companies, backed, in some instances, by American capital. Their proposals involve them in no liability whatever until after a supply from the Central Board is available in the areas which they have appropriated, and then they are only to be liable to submit such proposals as are reasonable commercial propositions.

Experience has shown, however, that there is a big difference between the proposition of a company and a municipality as to the chance of a would-be consumer obtaining a supply at reasonable rates. It is a most regrettable feature of our electricity supply industry that it is coming more and more under the dominance of financiers whose greatest object is to obtain high rates of interest; our industry is a very attractive investment, amounting almost to a gilt-edged security, and no wonder, therefore, that private interests are doing their best to thwart the progressive development of municipal supplies.

The example of our cheaper municipal electricity is a hindrance to the financial exploiters, and by every means in their power they bolster up the bogey of municipal trading, but it will be a bad day for the electricity consumers in this country if the municipalities lose their ascendancy.

I am sorry that the London County Council did not seize its opportunity of acquiring the company undertakings in its area, or alternatively, of seeing that in return for granting them another 40 years' tenure it had secured real protection and safeguard for consumers instead of the mythical "consumers' benefit," which is a totally inadequate concession, compared with the high rates of dividends secured by the companies over such a long period. There is an appeal to the Minister of Transport, but I have yet to learn of any such appeal resulting in a reduction of the charges to the consumers or a decrease in the profits of the companies.

We must see to it that our great heritage of municipal initiative, enthusiasm and energy is not cast aside and overridden by the dominance of private enterprise backed by American ideas and capital.

It is indicative of the coming changes that you have no paper at this Convention dealing with the problems of generation. Distribution will assume much greater prominence in the future to cope with the increased density as well as the increased amount of supply, but the business side will demand equal attention because we must push up the "units sold" by every means in our power.

A careful examination of the schemes so far published by the Central Electricity Board shows that their success and financial stability depend on a large and continuous increase in "units sold"; it is upon the undertakings themselves that the sale of units will depend, but the supply must be delivered to them on such terms and conditions as will enable them to get the business.

We must frame our tariffs so that they may be applicable to the various classes of load waiting for us; we must be right up-to-date in our advertising and selling methods, we must take our wares to the consumer, and not wait for him to come to us, we must give service on the best and most highly organised basis we can devise.

I still have great hopes for the future, despite the disabilities to which I have referred; I do not regard them as insurmountable, but we must face the position with courage and determination, and then I have no doubt that in years to come one of my successors will be addressing us, not on how to obtain the business, but how to cope with the overflowing demands made upon us.

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### Administration of Electricity Supply Undertakings.

By ALEXANDER SINCLAIR, M.I.E.E., and J. W. BURR, M.I.E.E. (Swansea Corporation Electricity Dept.).

(*Abstract.*)

At the present time it is unfortunately true that party politics and group interests have sometimes no inconsiderable influence in the appointment of committees, with the result that the committees have not always the full confidence of the council, and matters recommended by them are often subject to unjust criticism and may as a result be referred back or deleted from the minutes altogether. In these circumstances it is not possible for the electricity undertaking to make the progress it would if it were placed on the same basis as a company undertaking.

The electricity committee should work with sub-committees of its own members, and in the formation of these care should be taken to study the qualifications of each member. A suggested allocation of the duties of these sub-committees is: 1, management; 2, engineering; 3, and accounts.

The management sub-committee would deal with all questions of management, including the commercial development of the undertaking; the engineering sub-committee would deal with all matters appertaining to engineering and distribution; and the accounts sub-committee would deal with the purchasing of all material and the passing of accounts.

One of the most important factors in the success of any undertaking is the selection of its staff. Members of the staff must be specially selected for their particular work and, while technical efficiency is the qualification to be most desired, some consideration should be given to personality. The first essential to efficiency is mutual respect between the manager and the staff, and it is most desirable that *esprit-de-corps* should be fostered in every possible way. Before advertising a vacant position the manager should always consider the qualifications of any member of his staff to fill that position. Regular conferences should take place between the manager and the heads of departments and free discussions on relevant matters should be invited.

If the maximum efficiency is to be attained, the manager must be intolerant of inefficiency. A supreme test of management is in the maintenance of satisfactory relations with the staff and all employés. A cordial and responsive attitude is essential if the best relations are to be obtained. The authors would like to draw the attention of all authorised distributors to the following recorded view of the Electric Power Supply Committee of the Board of Trade:—

"The distributors must recognise that distribution is as important as generation and requires the same skilled technical direction. It would be a fatal policy if the distributors were to attempt to cut down their engineers' salaries just when the new and cheaper bulk supply ought to make them busier than ever."

The Committee presided over by Lord Weir recorded similar views, and the Commissioners in their report associated themselves with these views. The authors express the hope that the serious consideration of all owners of non-selected stations will be given to this matter.

The institution and appointment of a Central Displacement Committee of the National Joint Board has been suggested. This Committee will deal with cases of hardship and give assistance to engineers who may be displaced and to undertakings requiring engineers. The hearty co-operation of all undertakings with this Committee is most desirable.

The financial control of municipal electrical undertakings should be in the hands of the manager and not under dual control. The provision and repayment of capital and other financial matters which do not interfere with the policy of the department are, however, obviously matters with which the financial officer should deal.

To enable the manager to tell precisely what his generation and other costs are at any time, a good costing system must

be adopted, and the figures, to be of value, must be supplied immediately after the necessary data is available. All the materials required by the undertaking should be purchased by the electricity committee, and not by any other. In many instances a specification would be unnecessary and perhaps useless and, in such cases, a correctly drawn-up trade description could be adopted. It is a condition on which the borrowing powers of the authority are conferred that provision shall be made for the repayment of the loans by setting up a sinking fund to which contributions are made from revenue. It is only necessary to point out that, to the extent that the period of borrowing coincides with the working life of the asset acquired, this provision is in every way equivalent to the provision for depreciation in the case of an ordinary commercial undertaking.

In law there is no distinction in the case of a municipality between capital and revenue expenditure. All expenditure must be charged against current revenue unless borrowing power has been obtained. Borrowing powers are usually conferred in the case of "permanent works" (a rough definition of capital expenditure), but they may be granted for expenditure which, in the opinion of the Government Department, should be spread over a number of years. Moreover, certain expenditure which is undoubtedly capital expenditure may not be defrayed out of loans raised in the exercise of the borrowing power.

The provision of a reserve fund for an electricity undertaking is a matter of ordinary prudence. The Electricity (Supply) Act, 1926, applies an indirect pressure, by making it unlawful to apply any profits in relief of rates until the fund amounts to a specified amount. The fund is fixed at a maximum of one-tenth of the aggregate capital expenditure of the undertaking. It is required to be represented by investments in Government or certain gilt-edged securities, and the income of the fund is to be accumulated until the maximum is reached, when it becomes available as a credit to the general revenue of the undertaking.

Having applied the revenues as far as required by the section, and having established (if thought fit) a reserve fund, the 1899 Act provided that the surplus revenue in any year might be: carried to the credit of the local rate; or applied to the improvement of the district for which the undertakers were a local authority; or applied in redemption of the capital moneys borrowed for electricity purposes.

The new Act provides that the undertakers shall apply the net surplus remaining in any year and the annual proceeds of the reserve fund when this fund amounts to a prescribed limit: in reduction of the charges for the supply of energy; or in reduction of capital moneys borrowed for electricity purposes; or, with the consent of the Commissioners, in payment of expenses chargeable to capital; or in aid of the local rate.

This last appropriation is, however, limited in any year to an amount not exceeding 1½ per cent. of the outstanding debt of the undertaking, and after March 31st, 1930, is altogether precluded, unless the reserve fund of the undertaking amounts to more than one-twentieth of the aggregate capital expenditure on the undertaking. The Commissioners have also indicated that exceptional circumstances would have to be adduced in support of any application for their consent to any portion of the net surplus being applied to the cost of main transmission lines, high-pressure feeders and generating plant, except in the case of comparatively small items of expenditure in excess of loans previously sanctioned for these purposes.

The principle of trading undertakings of local authorities being organised financially so as to secure the provision of the service at cost (involving no charge on the rates and providing no relief to the rates) has been approved by the Local Legislation Committee of Parliament. The old view that a trading undertaking might be milked for the purpose of reducing the rates has gone.

The contribution in aid of rates is deferred (after March, 1930) until the reserve fund is established and until it amounts to half the maximum amount prescribed. The limitation to 1½ per cent. of the outstanding debt is a recognition of the fact that the ratepayers' credit is pledged with the repayment of the capital money borrowed for the purpose of the undertaking. It is also an acknowledgment of the undoubted fact that the undertaking has the advantage of being financed by the local authority at a less cost than would be possible if the undertaking looked after itself in that respect. It must also be remembered that the electricity committee acts in a similar capacity to a board of directors and is entitled to some financial consideration which should be placed to the credit of the corporation.

It is somewhat surprising that provision should not have been included for utilising part of the surplus in providing for the working capital of the undertaking, more particularly in view of the requirements as to investment of the reserve fund. Working capital is essential, and it is not normally a subject for borrowing powers. It may be provided, at least to some extent, by bank overdraft under Section 12 of the Rating and Valuation Act, 1925, but the provision of a definite sum for purposes of working capital would be a legitimate application of surplus revenues of the undertaking.

Judging by the figures which appear under the heading "Rent, rates and taxes," in the statistical returns dealing with the cost of generation, no uniformity seems to have been adopted in arriving at the basis of assessment. It may not be considered to be out of place here to deal with the usual method of assessing electricity undertakings for the purpose of local rating, which is as follows:

From the gross receipts for the year a deduction of the working expenses is made to arrive at the net income, these working expenses consisting of the cost of generation and distribution (less repairs and maintenance), public lamps, ground rent, management, insurance (less fire and boiler insurances), net cost of showrooms, and rates.

It is suggested that the system of rating at present operates unfairly against electricity undertakings, and apart from simplification urgently requires modification, so as to impose less onerous burdens upon public services. The Advisory Committee appointed by the Commissioners expressed the view that the present method of assessing electricity undertakings for the purpose of local rating required immediate amendment, and suggested that the assessment should be on the basis of profits with a rebate of 75 per cent. of the sum payable on account of the general district rate in respect of underground cables and works. The Commissioners are, however, of the opinion that this matter involves the wider question of the rating of public utility undertakings in general, and that the position of electricity undertakings could not be considered separately but only in connection with any legislation introduced to deal with the problem as a whole.

The basis of profits for the assessment of electricity undertakings is not a statutory basis, and indeed is not necessarily the only basis. The profits basis is merely one method of arriving at the rent which a hypothetical tenant would pay for the hereditament, which rate is the basis of assessment. It must be remembered, however, that the liability to rates does not depend entirely on the existence of profits. It is true there is authority to be found in rating cases for the view that when there are no profits, the hereditament, while still rateable, is to be assessed on a rateable value nil, and is equal authority for the view that beneficial occupation need not be profitable. In such a case, the non-existence of profits merely compels the valuer to seek some other basis of estimating the rent which the hypothetical tenant would pay for the hereditament.

There are three different "methods of repayment" prescribed by the Acts which confer borrowing powers on local authorities. They are: instalment method, annuity method, and sinking fund method.

A variation of the last method is the non-accumulating sinking fund, by which an equal instalment of the loan is set aside each year throughout the loan period. The amount of the annual charge differs in the case of the first two methods. The charge under the sinking fund method would be the same as under the annuity method if the sinking fund could be accumulated at the same rate per cent. at which the loan is borrowed. It is, however, necessary to make provision for some possible loss in the investment of the annual contribution, either through delay in investment or through a fall in the rate of interest.

The provision out of revenue for the redemption of the loan is in every respect equivalent to the provision of depreciation in the case of a commercial undertaking. In this connection, the instalment method of repayment is comparable with the "straight line" method of depreciation which was approved in the National Telephone Company case. This method results in an unequal charge against revenue. The earlier years bear the heavier charge. This can be justified by the fact that the asset acquired as a result of the loan will involve the undertaking in a heavier charge for repairs during the later years of its life, and there is also the question of obsolescence to be taken into consideration, thus tending to equalise the cost over the whole period.

The power to re-borrow and the provision of a common form of mortgage for all purposes has in recent years simplified the borrowing process, but a rigid separation of the accounts and transactions relating respectively to mortgages and stock has hitherto been strictly enforced. Now, however, progressive authorities have obtained powers to establish a consolidated loans fund which is in effect a capital pool. To the credit of the fund are carried *a* the proceeds of loans of every kind funded or unfunded; *b* sinking fund and redemption fund contributions; *c* certain capital receipts, *e.g.*, sale of assets; and *d* interest on investments.

There must be no unnecessary capital expenditure, and labour-saving and other devices should not be installed unless justified by the value of the economies effected over a period of years. As the total cost per unit generated is made up of capital as well as running charges, it does not always follow that the minimum cost of production is obtained at the point of maximum efficiency. It is possible to pay too much for the last one or two per cent. of efficiency. A courageous financial policy must, however, be adopted if the undertaking is to run efficiently and develop rapidly. A generating station equipped with the most modern plant and supplying electricity at a low cost per unit is a valuable asset to any municipality. It must also be borne in mind that a low electricity tariff is one of the factors which attract industries to a district.

Section 4 of the 1926 Act provides that the Commissioners are to prepare separate schemes for various areas and transmit them to the Board. The owners of selected stations are required to sell all electricity generated to the Board, and are not allowed to make a profit from the generation of electricity as the price at which it is to be sold is to be the cost of production, and they must re-purchase the amount they require for their own use at this price (adjusted according to the load

factor and the power factor of the supply given to the owners of the selected station together with a proper proportion of the Board's expenses) or according to the tariff fixed under the Act for the supply of electricity to the Board, whichever is the lower.

It is quite clear, therefore, that the owners of the selected stations are not to participate in any reduction of the costs of generation due to an improved load factor. It is assumed that the owners would not be penalised in the event of their generating plant being called upon to deal with peak loads to the detriment of the load factor. The question many members of councils have already asked is whether or not in the circumstances it is desirable that the generation of electricity should remain in their hands and that they should be asked to provide money for extending the plant at the selected station.

In the authors' view it is most desirable that municipalities should continue to operate existing selected stations and co-operate with the Board in every possible way. In the event of a new selected station being erected in any municipal area the obvious advantages would be reduced cost of production due to the use of more modern plant; increased ratable value; and increased spending power in the borough.

It would therefore appear to be the policy of municipalities not only to operate the existing selected stations and carry out any necessary extensions therein, but also to erect and operate any new selected stations which may be required in the future by the Board to be erected in their area.

In regard to those undertakings which are not or are not likely to become selected stations, under Section 10 of the Act, these undertakings may require a supply in bulk from the Electricity Board, and in the event of this option being exercised, they may be required to take the whole of the supply, either directly or indirectly, from the Board. In the same way, under Section 14, they may be required to take a supply similarly and to close down their generating station. The condition in either case is that it shall be shown that such supply can be given at a cheaper rate than it is possible for the station to generate. What policy should be pursued with regard to such undertakings during the interim period required for the full operation of the scheme contemplated by the Act, particularly in view of the fact that the Act provides for temporary arrangements being made between the Board and the owners of non-selected generating stations with respect to the giving of a supply and with regard to the working of the station?

It is clear that, ultimately, the decision of such questions of policy will rest with the Electricity Commissioners. In determining this question, however, the Commissioners will be bound to assume that the full development of any undertaking as a separate entity cannot be justified economically. The Act of 1926 necessarily involves this assumption. It also appears to follow that any interim development must be considered in relation to the ultimate scheme and not from the point of view of the separate undertaking. Thus the decision of the Commissioners would seem to be necessarily conditioned by the following considerations: the immediate needs of the consumer of electricity in any area of supply; and that the ultimate policy of the Supply Act of 1926 should not be frustrated by interim development of undertakings.

With regard to the second consideration, it is quite clear that in view of the Board's obligation under Section 10 of the Act, the indiscriminate development of existing undertakings (not being selected stations) would tend to defeat the object of the Act, which is to enable electricity to be generated in the most efficient and economical manner possible, by the concentration of generation in a relatively small number of large stations most favourably situated for cheap generation and inter-connected with one another. In such cases, in view of the possibility of early supersession of the new plant to be installed, a reduction in the period for which borrowing powers are granted must be anticipated, and, in addition to this, the usual provision must be made for wiping out outstanding debts in respect of the plant displaced.

These added charges to the total cost per unit will render extension a doubtful economy in most cases. It is true that in the application of Section 10 and Section 14 the cost of production per unit is to be ascertained without regard to the capital charges and capital expended on the generating station, and although interim development might consequently result in an extended life for the undertaking as a generating station, the fact remains that the total charge to be borne by the consumers in the area would probably exceed that which would be involved in the taking of the bulk supply from the Central Board, together with the charges on the station.

It is possible, within the limits indicated, that some development of existing stations might be justified; it is essential that in approaching the question the interests of the industry generally should be placed before that of any individual undertaking.

Many undertakers have undoubtedly taken advantage of the conditions contained in the Electric Lighting (Clauses) Act, 1889, and would not lay mains unless the income from the sale of energy therefrom was not less than 20 per cent. per annum on the outlay incurred. As a result, the capital cost of extensions had to be reduced to a minimum, and the engineer was unable to install cables of sufficient area to supply the consumers beyond their lighting requirements. That was false economy and certainly not business; the policy should be to extend the distribution mains in all districts where a load might reasonably be expected, and to put sufficient copper in the ground to meet a reasonable demand from domestic supplies. As pointed out by the Commissioners, the cost of doubling the area of a conductor is not great, and in most cases the extra expenditure is amply justified. All undertakers should undoubtedly take stock of their present position with the object of anticipating the developments which are likely to take place in the next few years. A scheme for supplying the whole area should be prepared and borne in mind when any extensions are made. As the annual repayment charges are known, it is easy to calculate the total annual charges for any scheme.

Insufficient attention is often given to the economical distribution of electricity. Economic distribution calls for as much attention as economic production. The advantage of improving the efficiency of a distribution system is not always realised. A 5 per cent. increase in efficiency would justify considerable capital expenditure on mains. It would be interesting to assume the item "units unaccounted for" as a consumer, and it is suggested that in view of the poor load factor and no diversity factor, a high charge would have to be made per unit to make the supply remunerative. It is obvious, therefore, that it is a paying proposition to improve the efficiency of the distribution system.

With regard to the adoption of a progressive distribution policy by undertakers, it is suggested that unless such a policy is adopted, the Government may come along with further legislation for placing distribution also under the direction of the Central Electricity Board. Most of the existing power stations will be shut down within the next few years, and bulk supplies will be given to the undertakers by means of overhead transmission lines running at a pressure of 132,000 volts and cables probably operating at 33,000 volts, or thereabouts. The question may be raised as to the continuity of supply under these conditions. While the technical difficulties of conveying high-voltage current have been largely overcome, there are one or two menacing factors still to be dealt with before overhead transmission lines can be considered to be absolutely reliable under all climatic conditions.

Cables running at 33,000 volts also have their faults and are not equal in reliability to 11,000-volt cables, for example. In the circumstances it is suggested that all undertakers receiving a supply from the "grid" should insist—as far as they can insist—upon a duplicate supply, preferably from a ring main.

The electrical industry constitutes a field where there is exceptional room for progress in the immediate future. A vigorous sales policy is, however, necessary to bring the advantages of the electrical service to the notice of the public, and this should be adopted without delay by all undertakers. The engineers chosen for publicity work must be able to talk clearly and logically in private and in public, and must grasp readily the consumers' conditions and requirements. It is necessary for every undertaker to have a showroom well stocked with fittings and the various types of apparatus, so that prospective users can examine and, if they so desire, purchase them. Much has been said about the "sale-of-fittings" clause in the Act. It is frequently forgotten, however, that many municipalities already had this power and no new principle was introduced.

The authors strongly advocate the holding of exhibitions as a means of introducing the electrical service to the public. Whole-hearted participation by manufacturers, contractors and supply authorities is, however, essential to success.

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### The Distribution of Electricity in Cities and Towns.

By L. ROMERO, M.I.E.E. (Salford Corporation).

***(Abstract.)***

The twin watchwords of the designers of distribution systems should be simplification and standardisation. Simplification should cut out all complications and elaborations of the system which are not absolutely necessary, particularly under the headings of switchgear, protective gear and pressure-regulation apparatus. Complications in these forms are generally more likely themselves to fail than are the really essential elements of the system which they are installed to protect; and thought, time and money are better spent on making an absolutely first-class job which will not break down than on over-elaborate apparatus for dealing with breakdowns and minimising their effects.

Standardisation should be carried as far as possible as regards: general lay-out; sizes and type of cable; sizes of transformers and sub-stations and arrangement of sub-station switchgear.

Safety must, of course, always be the first consideration, but the author does not wish to suggest that it is a difficult matter to provide adequately for the safety of operators, and his own experience of 26 years on the distribution side of a city undertaking without a single fatal accident may perhaps be advanced as evidence of this.

The chief danger arises from the rashness of the operators themselves, and the occurrence to be most guarded against is the opening of the wrong e.h.p. cubicle doors. It is essential to limit the right to open cubicle doors to the smallest possible number of men, who should all be fully trained members of the technical staff.

The number of fires which have originated in oil-filled transformers is extremely small, but where such transformers are installed in valuable buildings, the best available means should be used to protect the building and its contents against this risk. Owing to the fact that modern transformers are designed to dissipate in the form of heat only about 1 per cent.

of the energy they transmit, it is impracticable completely to protect them against a dangerous rise of temperature by the use of protective devices, operated by variations or out-of-balance of current, in the electrical circuit. Cases have occurred where failure of insulation on core bolts and on tightening bolts for coil-clamping rings have caused excessive rises of temperature of the oil, although the energy consumed by these faults was too small to operate the protective devices in the electrical circuit. The only sure method of protection against this risk is by the use of a thermostat in the upper level of the oil, arranged to open the switch supplying the transformer before the oil reaches a dangerous temperature, from the fire risk point of view.

Thermostats may also be used to protect transformers against excessive over-load, and they are particularly useful in an unattended sub-station where two transformers are operating in parallel. If under these conditions one of the transformers trips out, it would be desirable that the other should carry the load for as long as its overload capacity would permit, and this can most accurately be assured by using a thermostat, set to operate at the maximum safe temperature of the oil. If a thermostat is used for this purpose, it would, of course, also protect against fire risk.

Continuity of supply may be interrupted by (*a*) general failure of supply from the power station; (*b*) breakdown or failure of cable or other apparatus on the distribution system; or (*c*) deliberate disconnection for alterations, repairs or cleaning.

Interruptions under (*a*) do not properly fall within the scope of this paper, but, in the author's experience, the supply to any particular consumer is more likely to fail from this cause than from any fault on the distribution system, because a failure of supply from the power station affects all consumers, whereas a breakdown on the distribution system usually affects only a small percentage. It is to be hoped that in the inter-linking of stations under the national scheme special attention will be paid to the need for keeping sufficient plant running on the system at all times to maintain continuity of supply to all consumers on the occurrence of a generator failure. Interruptions under (*b*) should be of very rare occurrence on a modern network, and when they do occur, they should be confined to the smallest possible section of the network. The effects of a bad distributor "short-circuit" are, generally, much more localised on a.c. networks, which are usually small in area, than on d.c. networks, which are, as a rule, large and interconnected.

Owing to the recent rapid development in the use of electric cookers and fires, which may be in service at any hour of the day, mains engineers are finding it increasingly difficult to make sections of the network dead for alterations, testing or repairs, and it is now generally considered desirable to notify every consumer who will be affected before making any section dead. It has become, therefore, more than ever necessary to install the whole of the distribution system, and every component part, with the aim clearly in view of being able to maintain the supply to consumers while inspection, cleaning, alterations, and repairs are being carried out. It is preferable, for instance, to install network disconnecting boxes of the ring type, instead of the bus-bar type, as it is possible with the ring-type box to remove any link for cleaning, or for the insertion of an ammeter or switch, without interfering with the supply to any distributor. Similarly, it is advisable to provide for a short-circuiting device for each distributor fuse, in feeder pillars or at transformer sub-stations.

The maintenance of the supply pressure at the consumers' terminals, within the plus or minus 4 per cent. limit required by the Electricity Commission, is by no means an easy matter under all conditions, and the author is of opinion that a good case might be made out for some extension of this limit, say to 6 per cent. over and 4 per cent. under the declared pressure. The higher plus limit is suggested because this pressure would only be applied to the majority of consuming devices for a small portion of their working life, as it would generally only be reached during very light load periods. For this reason it is suggested that it would only have an extremely small effect in reducing the life of lamps and heating elements. However, so long as the total variation allowed is only 8 per cent., we have, of course, to do our best to comply with it.

In many cases it will, no doubt, be necessary to install static, variable-pressure boosters on the feeders leaving the power station, or at other points on the system, but this complication should be avoided wherever possible, and it is generally preferable to spend money on extra copper rather than on pressure regulators.

The author is strongly of opinion that multi-core, paper-insulated, lead-covered and armoured cables, laid direct in the ground and protected by covering tiles, provide the best system available from the points of view of low first cost, reliability, and low maintenance cost, whether the system of supply be d.c. or a.c. The only likely source of trouble with this type of cable is corrosion of the armouring and lead, and this must be carefully guarded by specially protecting the cables in soils that are chemically injurious.

There is one objection to the use of ducts with their associated draw-in and jointing pits, and that is that they provide means for the conveyance and collection in dangerous quantity of leaking gas, and a number of explosions have occurred from this cause, even where there was no fault whatever on the electric mains. This should be guarded against by effective ventilation of the pits, although ventilation is liable to fail during snowy and frosty weather. Bitumen, of course, should not be used either as a covering for the cable or as a filling for troughs.

Considerations of first cost should not be allowed to deter the distribution engineer from putting ample copper into his distributors. Two standard sizes are probably sufficient for all distributing mains, and it is suggested that these should be 0.25 sq. in. and 0.125 sq. in., with possibly a larger size for special cases. The neutral conductor should be of the same section as the phase or outer conductors throughout, in order to ensure reasonable pressure regulation with the large local out-of-balances which are sure to occur at times. All main and interconnecting distributors should be of the same size, *i.e.*, 0.25 sq. in., and the smaller size should only be used for such places as cul-de-sacs.

With the sizes of distributor suggested above, it should be possible to dispense with l.p. feeders entirely, except perhaps in the central districts of the very largest cities, and to deal with the future expansion of demand by installing more sub-stations, as it is obviously desirable to carry out as much of the distribution as possible at high pressure. On grounds of economy only two-wire services should be run into domestic premises, except for mansions of very large size. In an industrial district the fullest possible use should be made of transformer sub-stations installed on large consumers' premises for supplying the l.p. network outside. These sub-stations may be so close together in certain areas as to make the provision of sub-station buildings owned by the supply undertaking unnecessary.

In residential districts a scheme of this kind cannot, of course, be adopted, and the increasing difficulty of finding sites for 6,600-V or 11,000-V sub-stations in these districts is being severely felt. This raises the interesting question as to whether it may be advisable to introduce an intermediate distribution pressure, say 3,000 volts, in order to make the system more flexible by the much greater facility which such a pressure gives for placing transformers under the streets, with switch or fuse gear installed in above-ground street pillars. In the undertaking with which the author is connected, this arrangement was clearly indicated by the existence and considerable extension, in the residential districts, of 3,000-V single-phase distribution, before three-phase 6,600-V generation and transmission was introduced. This led naturally to the installation of large Scott-connected transformer sub-stations, transforming from three-phase 6,600 V to two 3,000-V single-phase. Each of these large sub-stations feeds a number of smaller 3,000-V single-phase sub-stations located at the best positions for the load and feeding directly into the l.p. network.

On the whole, the author is inclined to think that a good case could be made out, in many residential areas, for the use of an intermediate pressure.

The most promising means at present in sight for greatly improving the load factor is water heating by electricity, provided it is encouraged and developed on the right lines. Some undertakings have already introduced a specially low rate for this load, and this excellent example should be followed throughout the country. Domestic water heating by electricity, at ½d. per unit, is cheaper than any other method at present available of heating water for domestic use. At or about this rate per unit, the load, if supplied from an efficient modern power station, should be very remunerative and, by bearing part of the capital charges of the undertaking, should enable the prices of day users to be reduced.

The standardisation throughout the country of supply pressures and frequency is so obviously for the advantage of all, producers and consumers alike, that a few words as to its bearing on distribution and the methods the author has used to effect it may be of interest.

The undertaking with which the author is connected laboured under the disadvantage of possessing three l.p. declared pressures, *viz.*, 200, 220, and 240 volts, none of which were standard, 200 being the original pressure for the single-phase system; 220 volts was adopted by the consulting engineers in 1900 as the pressure for the new d.c. system and 240 volts was adopted as the three-phase low pressure in 1913, when three-phase generation and distribution were introduced in order to be in line with our big neighbour, Manchester. It may be noted here that two of these pressures, *viz.*, 220 and 240 volts, were the national standard pressures until the latest standards were introduced in 1925.

Last year it was decided to change all three of these pressures to the national standard pressure of 230 volts, and considerable progress has already been made, chiefly with the d.c. and three-phase systems, but also to a small extent with the 200-volt single-phase system.

The plus and minus 2½ and 5 per cent. tappings on the three-phase transformers have proved most useful in reducing the pressure from 240 to 230 volts and, as most three-phase motors are made and sold for a range of pressures of 400 to 440 volts, the reduction presents no particular difficulties.

It appears to the author that 220 and 240 V could easily be abolished as supply pressures throughout the country by the methods indicated above and, moreover, at only very small cost to the supply undertakings. The larger changes from 200, 210 and 250 volts present, of course, greater difficulties and expense, but as regards 200 and 210 volts, the increased efficiency of distribution and the increase in the capacity of the existing distribution system, taken in conjunction with the direct benefits to consumers of being on the national standard pressure, should be sufficient to justify the change for

municipal undertakings, at any rate, as these exist solely for the service of their public. The position of company undertakings, which exist also for the profit of their shareholders is, of course, rather different.

The change from 250 volts is the least attractive from the point of view of the supply undertaking, and a case might be made out for partial assistance, out of national funds, for undertakings with this pressure.

The change-over of undertakings with non-standard frequency to the standard frequency of 50 is also very desirable, both to facilitate the interconnection of power stations and to standardise plant and apparatus, but it is not quite so important from the consumer's point of view as the change-over to standard voltage, owing to the fact that non-standard voltage affects all consuming devices, whereas non-standard frequency only affects motors.

Mr. J. R. Beard, in his paper read recently before the Institution of Electrical Engineers, gave comparative estimates of the costs of (*a*) converting the e.h.p. a.c. supply to and distributing direct current, and (*b*) transforming to and distributing l.p. a.c. three-phase 4-wire.

The author is in substantial agreement with Mr. Beard's estimates of the savings to be effected by the latter system, and a short account of his experience, during the past six years, in changing over networks and large individual power consumers from d.c. to a.c. may be of interest to others.

The immediate aim of the change-over has been to prevent any growth of the d.c. load on the various rotary convertor sub-stations, in order to avoid having to install additional converting plant and d.c. feeders or new converting sub-stations. The ultimate aim is the complete elimination of d.c. distribution. The result, so far, has been a small reduction in the total d.c. load which may be considered fairly satisfactory, having regard to the fact that three-quarters of the network, at the commencement of the period, was d.c., that the number of a.c. units sold has increased tenfold since the change-over was commenced, and the a.c. units sold are now over 50 per cent. in excess of the d.c. units. The maximum feeding length on the d.c. system (that is the distance between rotary convertor sub-station and the farthest d.c. consumer) has been duced by about 1,000 yards.

The three following methods have been employed in this change-over scheme:—

(1) The change-over of existing three-wire d.c. networks in predominately residential districts to single-phase three-wire a.c. to enable the existing l.p. three-wire d.c. network to be used.

(2) The change-over of individual large industrial d.c. power consumers to three-phase.

(3) Every effort has been made to prevent the installation of additional d.c. motors, either by existing or new consumers, and a.c. mains (e.h.p. and l.p.) have been freely laid with this object. The existing d.c. mains, in the central and industrial parts of the city, are therefore gradually being duplicated with l.p. three-phase 4-wire distributors. This is followed by the change-over of the consumers to the a.c. mains and the eventual elimination of the d.c. mains.

The author would like to take the opportunity of making a complaint against the kilowatt-hour as the unit for selling electricity. Now that the selling price of the Board of Trade unit on the Norwich system is generally ¼d., ½d., or 1d., it must have become apparent to many that a unit ten times as large would be much more convenient, as it would enable small alterations to be made without having to use fractions or decimals of a penny. There seems to have been a general agreement, amongst framers of Norwich tariffs, to adopt a unit rate corresponding to actual coins of the realm, presumably with the idea that domestic consumers might find it difficult to understand the true value of decimals or fractions of a penny not corresponding to actual coins. There is little doubt that if ten kWh had been the selling unit, we would not have seen 5d., 7½d., and 10d. (corresponding to ½d., ¾d., and 1d. per kilowatt hour) as the only rates adopted. The author hopes that other members will express their views on this point, and that, eventually, an enlargement of the present unit may be made.

# The Institution of Civil Engineers.—II.

## Celebration of Charter Centenary, and Engineering Conference.

DURING last week the proceedings of the Charter Centenary Celebration of the Institution of Civil Engineers were carried out according to programme, the particulars of which we have already published. At the Conversazione on the Tuesday there were many members and guests present, and the evening was a success in every way. At the banquet held at the Connaught Rooms on the Thursday evening there were nearly 500 persons present, including some distinguished engineers and representatives of the Church, State, Army and Navy, and also of Art, Science and Law. The outstanding feature of the function was the reading of a message from Lord Stamfordham, in which he expressed the appreciation of the King of the congratulations sent to him by the Institution on the occasion of his birthday, and also of allusions in the loyal address to the interest taken by the Royal Family in engineering enterprise. Those who have attended the Celebration and Conference will no doubt prize for many years the souvenir of the occasion which took the form of a very handsomely produced and illustrated sketch of the history of the Institution.

The success of the more serious part of the proceedings, the Engineering Conference, was assumed by the presence of a large number of distinguished engineers, many of whom entered with zeal into the discussions. It was unfortunate in this connection that some of the discussions had to be so drastically curtailed because of the very limited time.

Of the total of thirty papers presented at the Conference, quite a dozen or so were directly or indirectly electrical, and were of a high standard. The following is a commencement of our abstracts of some of the papers and discussions:—

### Electric Transmission of Power as Applied to Large Areas.

By ARCHIBALD PAGE, M.I.E.E., M.Inst.C.E. (Chief Engineer, Central Electricity Board).

(*Abstract.*)

A consideration of the subject of electric power supply to large areas shows immediately that there are two questions of primary importance, namely: (1) the definition of "large area," and (2) the sources from which its supply of electricity will be derived and the location of such sources in relation to the area. With regard to the first point, recent developments indicate that such an area may comprise a whole continent, but for present purposes it is proposed to take national boundaries as the limits, with special reference to the case of Great Britain.

The second point will determine whether large amounts of power will have to be transmitted continuously over any great distance in one direction. If water-power or brown coal is employed, long-distance transmission, in the usual sense of this term, is practically inevitable, as the centre of gravity of any large portion of the load seldom coincides with the location of these sources of power, and it does not pay to transport such low-grade fuel.

It has become customary to classify the transmission system for supplying power to such an area into main and secondary transmission. The former has two functions, namely: (1) long-distance transmission of power in one direction, and (2) interconnection of important power-stations and districts—an outstanding example of which will be "the grid" in this country. Secondary transmission may also be subdivided as follows: (1) the part which is subsidiary to the main "grid," and is used for interconnecting other stations and providing bulk supplies for distribution purposes, and (2) the high-pressure networks belonging to authorised undertakers.

If the size of the area served and the extent of the load necessitate it, a tertiary transmission system is often employed by authorised undertakers, but as this is really a high-pressure distribution system, it is best excluded from the category of transmission. The ideal to be aimed at in designing a transmission system is to make electricity available without restriction throughout the country. The system chosen must therefore provide for infinite expansion in the most flexible manner possible, the charges to the consumer, and the reliability of supply being the real criteria.

So far as the main transmission system is concerned there is no alternative to overhead lines, and the natural characteristics of a country are the predominating factor in determining the general arrangement. For instance, in Great Britain the bulk of electrical power will always be derived from coal. Moreover, the price of the class of coal used varies very little in different localities, thus giving a wide choice of suitable sites for power stations. Many of those sites have already been developed, and the problem therefore resolves itself into selecting the best of them for association with the grid. This work, as is generally known, is now in hand. The three-phase 50-cycle system has much to commend it as a standard transmission system; the policy of standardisation of frequency, whilst sound in itself, introduces considerable complications, both financial and technical.

The voltage and carrying capacity of the "grid" lines

have been fixed at 132 kV and 50,000 kW. These were found to give the best balance of advantages on the economic side, and, as it may be necessary to use cable on certain sections, there were serious technical disadvantages in increasing the voltage above the figure chosen. In passing, it may be of interest to state that quite a considerable length of cable is in operation at this voltage in New York and Chicago. (ELECTRICAL REVIEW, February 26th, 1926, p. 349).

Experience with the first scheme has shown that the total cost of construction will be approximately equally divided between the lines, the transformers, and the switchgear. The circuit-breakers will have a rupturing capacity of 1.5 million kVA, but, although the number used in each sub-station and "grid" point (which are all of the outdoor type) will be minimised, the cost of tapping the main lines is still such that this will not be done for loads below 10,000 kW. The general design of the lines follows established practice, and lattice steel towers have been preferred to those of reinforced concrete.

The conductors will be of steel-cored aluminium with a diameter of 0.77 in. The corona voltage is 180 kV to earth, whereas the actual pressure to earth is 77 kV, so that, despite the published statements to the contrary, there will be little danger of luminosity, even under the most adverse weather conditions. The average span will be 900 ft., and the suspension insulators will be of the cap-and-pin type, nine to the string, this number having been decided upon after a careful study of the effect of foggy salt-laden atmosphere. The high insulation strength thus obtained, combined with the use of highly conducting and properly grounded earth wires, will form the chief safeguard against lightning. It is agreed that, so far, no means of escape from the consequences of a direct lightning-stroke exist, but induced voltages due to lightning, which, according to Mr. F. W. Peek, are of the order of 50 kV per foot of line height, say, 1.5 million volts in the case of the "grid," are not likely to exceed the impulse insulating value of the insulator chains, if the screening effect of the earth wire is taken into account. The risks to the insulation of the transformer end-turns from these shock pressures have been greatly reduced as a consequence of recent technical developments.

The stability of the "grid" system is intimately connected with the problem of voltage control. Control will be obtained by "on-load" tappings on the transformers, and the object is to operate the lines at or near unity power factor, some of the alternators at selected stations acting as rotary condensers. The lengths of individual line units do not exceed 40 to 50 miles, which renders the problem comparatively easy. The preliminary operation of the "grid" included in any particular scheme will be carried out on the principle of "solid" interconnection, as distinct from loose linking, but provision will be made whereby alterations in the arrangement can be easily effected, and also for the use of additional reactance should this be found necessary.

Every effort has been made to secure the most sensitive and accurate means of disconnecting faulty lines without disturbing sound sections. The work of British manufacturers is unique in this respect, and there is every reason to hope that the protective system employed will ensure continuity of supply. Nothing approaching standardisation of protective gear is as yet possible, and it appears certain that it will be necessary to use systems both with and without pilots in order to obtain the most economical solution. Under the head of secondary transmission there is not much of special interest to record. Pressures range from 11,000 volts up to 66,000 volts, and it may be well to remark that the sub-divisions referred to earlier do not mean duplication in any sense.

Underground cables will, as hitherto, continue to be extensively used. The early efforts to extend the range of economical power transmission by using 33 kV three-phase cables were somewhat unfortunate, but the reasons for the failures which occurred are now well known, and the constructional weaknesses have been finally overcome. Three-phase cables for voltages up to 60 kV are now in successful commercial use, and single-phase cables for 66 kV are in extensive operation.

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### Discussion.

Sir JOHN SNELL (Chief Electricity Commissioner), who opened the discussion, indicated the now well-known reasons for the Electricity Act of 1926 and the previous legislation which led to the appointment of the Electricity Commissioners with a view to securing a co-ordinated scheme of electricity supply in this country, and also outlined the advantages to be obtained from such a scheme. The result was that under the scheme now being prepared by the Central Electricity Board and the Electricity Commissioners it would be possible to concentrate the high-load-factor energy in the best base-load stations, with resultant economy, leaving other stations to deal with the more local load and the remainder of the load curve. That had been found, in fact and in practice, to be the best combination. Therefore Mr. Page was right in saying that that being the object of his transmission scheme, the distances over which transmission would take place were necessarily small. Fifty miles was probably the maximum distance, and the design of the lines was dominated by this fact. The transmitting capacity of the lines was some 50,000 kW, that being approximately the maximum size of a single generating unit. The lines were being laid down on the ring system, so that there would be alternative ways of reaching the generating source. There would also be local lines, because at some time or other the water-power resources of Northern Scotland would be developed and brought into the general scheme. Last year there was the curious uneconomic result, due to present conditions, that no less than 70 per cent. of the actual revenue-earning plant had to be held as spare. The whole point of the 1926 Act—which he knew had caused considerable interest among our allies and friends across the seas—was that money could be better invested in a well-designed transmission system than in unnecessary reserve plant. Reference had been made by Mr. Page to the Electricity Commissioners' Regulations; it was not understood by his compatriots, said Sir John, that the Commissioners had the dual duty of stimulating and regulating the supply of electricity and, at the same time, of securing public safety; and it was not always easy to preserve the balance between these two functions. He could assure Mr. Page that his specifications easily complied with the Commissioners' Regulations. There was, perhaps, one factor to which special regard would have to be given, *viz.*, road crossings. There were many opinions about that, but there was one happy alternative in the Regulations which was left delightfully vague, because the Regulations stated "or such other means as may be approved by the Commissioners." He could not help feeling that, with the strength of construction proposed by Mr. Page, it would not only not add to public safety to swathe the crossings in cradles, but it would create an absolute menace.

Mr. F. H. CLOUGH dealt with lightning protection and voltage control, and said that if breakdown due to this cause was likely to occur, the damage in ascending order of importance would be to line insulators, switchgear, and transformers, and as it was not possible to avoid damage from lightning entirely, the relative strengths of the insulation should be arranged in this order. It was obviously undesirable to strengthen the line unduly, as the trouble might be passed on to the more expensive apparatus. As guard wires provided a means of reducing the voltage induced in a line due to a lightning discharge, the proper solution would appear to be to place additional guard wires over the line near a switching station and reduce the number of suspension insulators. Horn tips should be provided to equalise the wet and dry values of flashover of the insulators and bushings, and to ensure that external flashover will occur before an internal breakdown of the apparatus. As regarded voltage control, full advantage should be taken of synchronous machines, in working out any portion of the "grid" system, at the point of power distribution in order to improve the power factor and ensure good voltage control. The capacity current for 50 miles of 132,000-V line amounted to about 8 per cent. of its normal load of 50,000 kVA, and, therefore, was about equal to the magnetising current of the step-up and step-down transformers. With a high-voltage line between the points of generation and distribution there would also be the reactance of the line and transformers in addition to the load reactance.

Mr. R. O. KAPP remarked that when they realised the point made by Mr. Page that the lines he had referred to were interconnectors and not long-distance transmission lines, it caused them to revise their view of the whole subject. Being interconnectors, they only had to take a proportion of the energy generated in the country, about 20 per cent., and this in itself must have a considerable influence upon the design of the whole "grid" system. If only 20 per cent. of the total energy passed over these lines the energy losses in the lines would be proportionately small; they would be only of the order of 0.15 per cent., and therefore need hardly be taken into account. From the point of view of interconnectors the lines would do hard work three times a day, not like the ordinary station which had one peak a day. The country was divided into three sets of stations, and at intervals of eight hours the stations would be started up or shut down, and each time it might mean that a different service would be demanded from the "grid." The principal peak load might easily come on at night. Also, as the "grid" lines were interconnectors, it might happen that they would do some of their hardest work in the early years, and as the load over the country increased, the amount of interchange of energy passed over the "grid" lines might actually be reduced rather than increased. Mr. Kapp said the "grid" might be regarded as a clothes line held up by a lot of props, and the raising or lowering of one prop would affect the others. There would come about a struggle between the various power stations, each tending to push wattless current on to the other, and the result would be to pull down the "grid" voltage. The simple remedy was to provide somebody to increase the voltage at a special point. The case, however, illustrated one of the features of an interconnecting system.

Dr. J. W. LIEB (New York Edison Co.) said that the total output of electricity in the United States was 80 thousand million kWh, and in Canada 14 thousand millions. The output had doubled, on the average, every seven years. The number of supply authorities was 4,000, but they were decreasing owing to consolidation and absorption. Interconnection had gone so far, indeed, that only a few weeks ago nearly one-third of the United States was synchronised as one single system, and such great cities as Poston, Buffalo, Chicago, Cincinnati, and others were all connected into one network whose lines embraced 28 States. That represented a jointly-operated

system of something like 1,000 miles. In 1919 about 37 per cent. of the power output was generated by hydro-electric plant in the States, but that ratio had fallen to 34 per cent. in 1925, although in the past three years it had been restored to about 39 per cent., and as long as coal remained at its present price he thought hydro-electric plant would be developed with considerable reluctance.

Dr. S. Z. DE FERRANTI remarked that for a long time he had felt, rather as an outsider, that the greatest trouble in electricity supply was the uncertainty and cost of switchgear plant and operations, and he still felt that to-day the outstanding thing required more than anything else was a vastly more successful switching system that we had at present. If we could cut off these enormous supplies of power with absolute certainty when something went wrong, the whole system of operation would change. Mr. Page had stated that it was not worth while from a commercial point of view, and probably not from the technical point of view, to tap the "grid" for less than 10,000 kW. That, however, was a direct condemnation of our apparatus and appliances as they were to-day. It was a very serious thing when we thought of that limitation; there were many other things in the way of economic distribution of electricity that we could do if we could only handle the current more easily, more cheaply, and with complete certainty.

Mr. C. D. TAITE referred to the question of protective schemes and systems of relays. From experience it was a very difficult matter to get a system which would work with entire satisfaction under all conditions. The troubles which had arisen in some cases had been with the current transformers, and those, of course, would remain with the 132,000-volt system. The troubles had taken the form of failures on the secondaries of those transformers, due to high voltages induced at the times the faults occurred, and in many cases these faults had not shown themselves until a further fault had occurred when a line had operated and had been cut off, as it should not have been cut off if the transformer had not been faulty. There were two principal conditions under which those main lines would work, *viz.*, full load and light load. During full load there might be enough power available to burn out and destroy any fault that might occur, or, at any rate, sufficient to open the circuit breakers which, he imagined, would have some overload protection. The difficulty, however, was at time of light load, which existed for two-thirds of the whole period of the year.

Mr. ALEXANDER DOW (Detroit Edison Co.) said the question of loose linking was all a matter of the conditions. His name had been associated with loose linking, but there were some conditions in which he would tie things up as tightly as he could. Generally, however, under the conditions he had to deal with, loose linking was necessary in some form. The whole thing could be summed up by saying—study your conditions and predetermine what was going to happen. He was glad that we in this country had solved the problem of the 33,000-volt cable, although he did not use it. He gave a large supply on 24,000-volt cables, and those played all the tricks that cable could do. Great Britain was entering on a wonderful experiment, and would learn a great deal from it. The United States had nothing to preach to us, and as regarded many things, could not teach us anything.

Mr. PAGE, replying to the discussion, commented on the solution of the 33,000-volt three-phase cable problem. There had been many difficulties, and although he did not suggest there would not be others, the problem of the 33,000-volt cable was certainly on a very much better footing than it was before. It was useful that the difference between the grid and ordinary main line transmission had been stressed. On the matter of spare plant there was no doubt that the industry to-day was carrying far too much. Sir John Snell had given the figure of 70 per cent., but some of the critics of the various schemes had hinted that we were swinging too much in the other direction. Anyway, that figure of 70 per cent. would be enormously reduced in the future. He hoped it would be possible to appoint gentlemen of the type referred to by Dr. Lieb, who took control and said how the load should be dealt with. Then, if anybody moved his clothes props—to use Mr. Kapp's word—in a manner which was not permitted by the head washerwoman, he would get into serious trouble. As for control, if the old folks could not find a better method, perhaps some of the younger generation would come along and show us how to control power without opening any switches at all; and that was not perhaps so Gilbertian as it might appear. Certainly we must strive very hard indeed to find some better way than merely an extension of the old style of opening the circuit. Mr. Taite apparently required handling very firmly because he seemed to have got the impression that this great system was going to be tied solidly, and that when there was a fault on one of the lines the whole system would come down. That was not so. The idea was to extend and, he hoped, improve what the power companies had been doing for a long time, and it would be the business of the Central Electricity Board to make certain that when there was any energy which had got out of control, the part of the system where that was happening should be locked off instantly without any trouble. He did not suggest that they would succeed all of a sudden, but there certainly was some misapprehension between working the system solidly and as a loose linked system.

# Parliamentary News.

[By Our Special Parliamentary Reporter.]

### Railway Road Transport Bills.

In the course of the inquiry by the Joint Select Committee of the two Houses which is considering the Railway Companies' Road Transport Bills, evidence was given last week by Mr. W. Chamberlain, general manager of the Leeds Corporation tramways. Mr. Chamberlain claimed that if the railway companies were allowed to use the roads the provincial tramway undertakings would be forced into the situation in which the L.C.C. Tramways found themselves. They would incur deficits on account of wasteful omnibus competition. He considered that the railway companies would be better employed if they studied electrification rather than endeavouring to run omnibuses.

On June 7th, Mr. T. COOPER, K.C., spoke against the Bills on behalf of the Scottish burghs, and evidence was given by Mr. R. S. Pilcher, general manager of the Glasgow Corporation tramways. Mr. Pilcher said that the Corporation was running in conjunction with its tramway system a number of unremunerative 'bus services which would have to be stopped if the railway companies commenced to run 'buses. He maintained that existing statutory undertakings should be protected against this suggested new form of competition.

On June 11th Mr. CRAIG HENDERSON, K.C., on behalf of the Tramways and Light Railways Association, opposed the Bills, and said that his clients were entitled to a protective clause prohibiting the railway companies from competing with tramways where, in the opinion of the Minister of Transport, the service was adequate and satisfactory.

### Proposed Tyne Tube.

A Select Committee of the House of Commons considered last week a Bill providing for the construction of a tube railway beneath the Tyne connecting North and South Shields. The estimated cost of the scheme was said to be £250,000. There was opposition by the Tyne Commissioners, who run a ferry across the river.

### The Rating and Valuation (Apportionment) Bill.

On June 5th, Mr. KELLY asked whether, under the provisions of this Bill, an industrial establishment which generated and distributed electricity to itself would be entitled to the relief from rates for the whole of its establishment, including the generating plant; and whether the relief would be afforded if, in addition to supplying its own works, it provided electricity to others outside its establishment.

Sir KINGSLEY WOOD answered that it was thought that the question could most conveniently be dealt with in the discussions on the Bill.

In moving the second reading of the Bill in the House of Commons on June 6th, the Minister of Health (Mr. NEVILLE CHAMBERLAIN) referred to the position of public supply undertakings which it was proposed to exclude from the scope of the Bill. He said that although an undertaking of that kind was undoubtedly productive to a considerable extent, it was partly distributive. It did not confine its supply to industry, and it was considered better to apply the £4,000,000 of which this class of undertaking might be relieved to give direct relief to industry itself. There was no guarantee that if supply undertakings were de-rated the relief given would go to stimulate industry, which was the purpose which the Government had in mind.

# Correspondence.

***Correspondents should forward their communications as early as possible.*** *No letter can be published unless we have the writer's name and address in our possession.*

### Differential Tariffs for Electricity Supply.

We hold a Special Order for the Urban District of Ashford, and we shall shortly have a Special Order covering the adjacent parishes of Kennington and Willesborough. In these Special Orders the maximum rate to be charged is quoted as 10d. per unit. I have now arranged for a supply to the town of Wye, about four miles off, for which I shall be obtaining a Fringe Order, to be followed up by a Special Order. I have agreed with the Wye Parish Council that the rates to be charged in Wye shall be 10 per cent. more than those obtaining in the Urban District of Ashford, to cover the transmission costs and losses.

The point now arises whether, in the Fringe Order or under the Special Order which will later be obtained, we have power to make this extra charge, assuming always that with the 10 per cent. we do not exceed the maximum price stated. What I want to do with the rural supply is to grade the price according to the distance from the works, and I should like to know whether there is anything in the Electric Lighting Acts authorising me to do so.

In the case of our assisted-wiring scheme we are already charging 10d. per unit for a certain number of units, 2d. of this being understood to be in payment for the wiring. In the case of Wye, 10 per cent. will therefore actually exceed the

maximum price, but it will be for a specific purpose, and will be shown at the bottom of the bill, and not as 11d. per unit. Any information which you could give me on this point would be very much appreciated.

**H. Wilson.**

Ashford, Kent.
*June 9th*, 1928.

[There appears to be no objection to charging a special tariff in the outside areas; this practice is already followed by various undertakings. The Acts require that no unfair discrimination shall be exercised, as between consumers where all the circumstances are similar. But where the consumers are at widely different distances from the power station a distinct difference obtains, and different tariffs can be made—see our footnote to a letter on page 970 of our issue of June 1st, 1928.

A charge for assisted wiring is not a price per unit, but rent and/or purchase, and is authorised as rent in the Act of 1919, Section 23, and as rent or purchase in the Act of 1926, Section 48 (which is very wide in scope). Revenue from such charges must be shown separately in the accounts of the undertaking. —Eds. Elec. Rev.]

### Alternating-Current in Three-core Mains.

The present vogue of changing mains over from direct current to alternating current is undoubtedly a step in the right direction, but is often attended by difficulties, unforeseen upon a cursory glance at the situation. Most direct-current distribution is three-wire, with earthed neutral, and the majority of d.c. distributors are three-core cables; on the score of cost, these cannot be ripped up and replaced with four-core cables, so that the a.c. has to be fed, temporarily, at any rate, through these three-core cables. The only method of doing this is to make two of the cores into phase conductors, and to connect the remaining core to the neutral or star-point. Thus, one phase is totally unloaded, and the system can be vectorially represented by fig. 1, OA representing the current flowing in the red phase, OB the current flowing in the blue phase, and OC the current flowing in the neutral. Obviously, if the load is non-inductive, and balanced, then: OC=OA=OB, or, in other words, the current flowing in the neutral is of the same magnitude as that flowing in each of the phase conductors, and so the pressure drop will be $\sqrt{3}$ times as great.

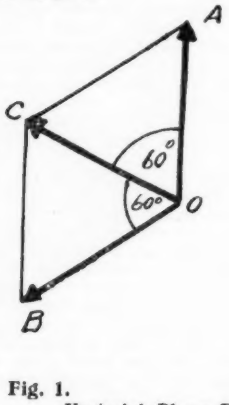


Fig. 1.

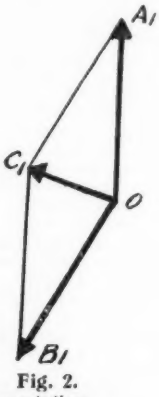


Fig. 2.

**Vectorial Phase Representation.**

Now I would suggest that all inductive load, such as single-phase motors for battery-charging motor-generators, &c., should be connected between the blue phase and neutral, and that this load should be balanced by non-inductive load, connected to the red phase. This would cause the current in the blue phase to lag, and the system could then be vectorially represented as in fig. 2.

We see that angle $A_1OB$, is now more than 120 deg. due to $OB_1$ lagging, and $OC_1$ is therefore shorter than OC; in other words, there would be less current flowing in the neutral, and a corresponding diminution of pressure drop.

The extreme and ideal case would be when a 0.5 power factor obtained in blue phase, when $OB_1$ would be equal and opposite to $OA_1$, and therefore $OC_1$ would be zero. Therefore, if it were possible to procure a 0.5 p.f. in blue phase, there would be no current flowing in the neutral, and so the only pressure drop in the distributor would be that due to the current flowing in the phase conductor, and the same ideal conditions would be produced as formerly with a perfectly balanced three-wire d.c. distributor.

I should be pleased to hear your readers' opinions of this and also if, to their knowledge, such an experiment has ever been made.

**H. M. Price.**

Birmingham, *June 5th*, 1928.

### Change-over of Supply.

May I give a word of warning to those engaged in change-over from d.c. to a.c. as to the sizes of motors? One naturally imagines that a three-phase motor will be satisfactory if it is of the same capacity as the d.c. motor it is to replace, but in many cases it will be found that this is not the case. Some of the old d.c. motors run comfortably at anything up to 100 per cent. overload, in which respect they differ from modern a.c. motors. It is essential to find out the actual loads that the motors are carrying and to make the new motors big enough.

This applies even more to single-phase motors, which are notoriously bad at starting against load, and are not good at overload work.

One difficulty which occurs is that the consumer who has a large d.c. motor running on a small load usually wants the same capacity a.c. motor, while if his d.c. motor is overloaded he wants an a.c. motor of greater capacity than the d.c. motor. The best way to deal with these matters is to make careful measurement of the power used before orders are placed for the change-over motors.

Where the change-over is of a very complicated nature, such as for newspaper printing machinery, it is much better to pay the consumers a lump sum and let them do their own change-over. *Verb. sap.*

**Adsum.**

*June 7th*, 1928.

### Wanted—a New Word.

In your editorial columns this week you raise the difficult question of nomenclature for electrical units. It seems a pity that we Britishers, unlike the Germans, have a great antipathy to long compound words—but surely such compounds as kilo-volt-ampere, kilo-watt-hour, are easily spoken and convey their derivation both in speech and in print. If for the lay public some shorter terms must be adopted, the practical course seems to be to perpetuate the names of men who have done pioneer work in connection with the subject—as we have done in the case of the simpler units. If these names are selected by an influential body, such as the B.E.S.A., it only remains for the teachers in our colleges and schools to see to it that they are universally adopted.

Your suggestion of a "family word with inflections or affixes" would surely result in a sort of telegraph code, such as manufacturers print in their catalogues, where the affix conveys no idea whatever of the object named. In the case of the kilo-watt-hour, where the lay public wants some short term corresponding with the "therm" adopted by the gas industry. I suggest that "kilowr" (kill-ow-er) would stand a better chance than any family word with inflections and affixes. But surely it would be no more difficult to get the "Kelvin" universally adopted. Why not a national campaign on the part of electrical men to honour our great men by insisting on their names being used in this way? With regard to the quantity "Volts × amps. × sin $\theta$ ÷ 1,000," for which Mr. Kapp asks for a suitable name, I suggest that the expressive name would seem to be "pseudo-kilowatts." It would be easier to popularise "kilowattles," but "kil-sin-watts" and "kilsinowrs" (kilo-watt-hours × sin $\theta$) would perhaps be more dignified.

**R. A. W.**

Woolwich, *June 5th*, 1928.

[The kind of "family" name we had in mind may be exemplified by the word "ion," from which are derived "cathion" and "anion."—Eds. Elec. Rev].

In view of the pioneer work of the late Dr. Gisbert Kapp, I suggest that the quantity "Volts × amperes × sin $\phi$ ÷ 1,000" should be called "Kapps"; that the same quantity multiplied by hours should be called "Kapp-Hours," and that the instrument measuring this quantity be called a Kappmeter. There were, and are, many other pioneers in this field; but to me the name Kapp seems a very suitable word to employ, having the same brevity as volt or watt.

**E.**

*June 9th*, 1928.

I have noticed the correspondence in your journal regarding a name for the unit of loss due to power factor.

We talk of "Input" and "Output"; I suggest that the difference be called the "Exput." This term could be applied to all forms of efficiencies. The name I suggest for the unit is "Kilo-Not-Hours." It would look better if it were spelt "Kilo-Knot-Hours."

It is interesting to note that another unit that has no name is the engineer's unit of mass.

The search for a name is certainly more amusing than cross-words.

**B.**

Eastbourne, *June 9th*, 1928.

[The late Prof. John Perry used the word "slug" for the engineer's unit of mass in the foot-pound-second system.—Eds. Elec. Rev.]

### Stays for Section or Angle H-Poles.

I should be pleased to have the opinion of any of your readers who deal with the erection of overhead transmission lines as to the manner in which any poles which take more than a 10-degree angle should be stayed. My experience teaches me that this is a case where theory put into practice does not obtain the expected result.

For example, an H-section pole taking an angle of 12 degrees has four stays, two going each way of the line, and in a direct

balanced pull I find that in nine instances out of ten there is a tendency to pull the pole over at the head unless it has a stay pulling against the angle. My opinion is that all these poles should be stayed with angle stays in addition to the stays each way of the line, and I should welcome advice on this subject.

**Lino.**

*June 11th*, 1928.

### Trade Union Interference.

Mr. W. A. Jones is endeavouring to evade important facts, *viz.*, that when the chief engineer informed the Electrical Power Engineers' Association that he would require a man with more experience to fill the post, a suggestion was made (presumably by the Association) that the matter should be referred to the District Joint Board for adjudication; and that, further, when the employers' side wished to lay down the principle that the Board should concern itself only with the grade attached to a position, the employés' side would not subscribe to this.

That was the attitude of the Electrical Power Engineers' Association towards the matter as stated in its own journal, and unless the Association now informs your readers that this particular employé has *not* been promoted to the higher grade, there appears to be little room for complaint of a "gross distortion of the decision." Mr. Jones is now endeavouring to close the discussion with a pious expression that he never meant anything more than the finding of the District Board, as quoted by Alderman Higham, indicated.

The secretary of the Electrical Power Engineers' Association should read again the article in his own journal before entering into controversy; he might also with advantage ponder over the following sentence which appears in the May issue of that journal:—

"An engineer who, in order to secure selfish advancement, or pecuniary gain, disregards the injury which he may be doing to his fellow engineers is unworthy to be called a member of the profession."

"M.Inst. Fuel," who writes under date of May 19th, has apparently some bee in his bonnet, but as it is not from the Ashton hive, the author may be pardoned for not dealing with his courteous communication.

**The Writer of the Article.**

*June 11th*, 1928.

There would surely appear to be a great deal of undue importance attached to this matter and, in view of the fact that apparently most of the benefits obtained in the last few years have been to the advantage of the employers, the original article would appear to be singularly out of place. In any case, if there is no actual grade for the job, there would not appear much to argue about.

The whole matter seems such a trifle when so many other big and important things are waiting.

**Sense.**

*June 11th*, 1928.

# Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

#### 1926.

28,419. "Alternating-current commutator motors." British Thomson-Houston Co., Ltd. and H. Dreghorn. November 11th, 1926. (290,311.)

#### 1927.

257. "Alternating-current electric motors." M. Doloukhanoff. January 4th, 1926. (263,884.)

1,298. "Electricity prepayment meters." Chamberlain & Hookham, Ltd., and S. James. January 15th, 1927. (290,694.)

1,408. "Electrical connecting leads." W. Haddon, J. M. Burnett and J. A. Fullilove. January 17th, 1927. (290,696.)

1,602. "Dielectrics of condensers and the insulation of cables and other conductors." Telegraph Condenser Co., Ltd., and S. G Brown. January 19th, 1927. (Cognate applications, 11,515/27 and 23,980/27.) (290,699.)

1,734. "Artificial lines for telephony and telegraphy." General Electric Co., Ltd., and A. C. Bartlett. January 20th, 1927. (290,701.)

1,922. "Electrodepositing of metals." J. F. Bennett and J. Hadfield. January 22nd, 1927. (290,704.)

3,905. "Diaphragms for loud-speakers and like sound-reproducing devices." J. H. T Roberts. February 12th, 1927 (290,710.)

4,358. "Electric switchgear." British Thomson-Houston Co., Ltd., H. C. Heath, and H. Trencham. February 16th, 1927. (290,715.)

4,475. "Tone-current generators." Automatic Telephone Manufacturing Co., Ltd., and T. R. Rayner. February 17th 1927 (290,724.)

4,729 "Interlocking arrangements between circuit breakers and other switches." British Thomson-Houston Co., Ltd., A. G. E. Joyce, and H. Trencham. February 19th, 1927. (290.735.)

4,748. "Magnetic core material and method of manufacturing same." Standard Telephones & Cables Ltd. (Western Electric Co., Inc.). February 19th, 1927. (290,736.)

4,824. "Electric measuring instruments." G. F. Shotter and Crompton and Co., Ltd. February 21st, 1927. (290,738.)

4,918 "Fire-alarm telegraph systems or apparatus." Standard Telephones and Cables, Ltd, and E. M. S. McWhirter. February 21st, 1927. (290,743.)

4,920. "Electromagnetic operating means for counters." Automatic Telephone Manufacturing Co., Ltd., and W. A. Phillips. February 21st, 1927. (290.744.)

4,926. "Submarine signalling cables." Western Electric Co., Inc. February 27th, 1926. (268,714.)

5,046. "Electrolytic manufacture of compounds containing active oxygen." K. Carpmael and K. S. Carpmael (legal representatives of W. Carpmael (deceased). (I. G Farbenindustrie Akt.-Ges.). February 22nd, 1927. (290.750.)

5,365. "Electrically-operated selecting devices." Siemens Bros. & Co., Ltd., and H. Richmond. February 25th, 1927. (290.763.)

6,178. "Variable electric resistances." Drysdale & Co., Ltd., J. W. W. Drysdale. March 5th, 1927. (290,767.)

6,415. "Electric cables." W. Brown. March 8th, 1927. (290,770.)

6,480. "Dynamo-electric machines." R. Townend and Metropolitan-Vickers Electrical Co., Ltd. March 8th, 1927. (290,772.)

7,207. "Electrical alarm devices for hose reels." J. Nicholson. March 15th, 1927. (290,777.)

9,713. "Electric razor and blade therefor." W. P. Aron and H. I. Gahagan. April 8th, 1927. (290,796.)

9,893. "Electric coupling devices." General Electric Co., Ltd., and R. J. Kaula. April 11th, 1927. (290.797.)

11,006. "Electric cables." Callender's Cable & Construction Co., Ltd., J. F. Watson, P. V. Hunter and A. E. Wilson. April 25th, 1927. (290,806.)

11,222. "Electric starting apparatus for internal-combustion engines." C. B. Walker and R. J. Mitchell. April 27th, 1927. (290,808.)

12,417. "Electric switches." General Electric Co., Ltd., and A. E. Angold. May 9th, 1927. (290,819.)

12,515. "Protection of parts of electrical apparatus." C. R. Little. May 10th, 1927. (290.820.)

12,866. "Electrically-heated water-storage cisterns." Inventum Electrical Appliances, Ltd., and A. Wright. May 13th, 1927. (290,821.)

13,154. "Automobile lamp." M. H. Kern. May 16th, 1927. (290,824.)

13,493. "Electric circuit-control apparatus." British Thomson-Houston Co., Ltd. May 20th 1926. (271,487.)

13,613. "Vacuum electric tube devices." Westinghouse Electric and Manufacturing Co. May 20th, 1926. (271,506.)

14,187. "Electric batteries." Siemens Bros. & Co., Ltd., and C. R. Riber. May 26th, 1927. (290,836.)

17,890. "Construction of electric soldering irons." I. Knowles and F. Knowles. July 6th. 1927. (290,855.)

17,910. "Rear and number-plate electric lamps." R. W. Neale. July 6th, 1927. (290,856.)

18,947. "Electromechanically-controlled switches and switching systems for use in automatic telephone exchanges and other remotely-controlled systems." F. Aldendorff. November 19th, 1926. (Divided application on 29,268/26.) (290,859.)

21,000. "Instruments for measuring the field strength of permanent magnets" Telefonaktiebolaget L. M. Ericsson. August 28th, 1926. (276,632.)

21,953. "Burglar alarm." W. L. Casey. August 20th, 1927. (290,869.)

22,666. "Transformers for arc-welding." R. Sarazin. February 12th, 1927. (285,065.)

23,015. "Induction meters." Siemens-Schuckertwerke Akt.-Ges. September 3rd, 1926. (277,015.)

23,692. "Electric lighting systems." R. J. S. Crowe and W. A. Green. September 8th, 1927. (290,879.)

24,406. "Electrical arrangement for rendering perceptible currents of substantially the same frequency." M. Wald. January 26th, 1927. (284,250.)

24,461. "System for delivering alarm calls or signals over the connecting lines of telephone installations" Siemens & Halske Akt.-Ges. September 21st, 1926. (277,960)

24,477. "Vessels or receptacles for electric accumulators." W. Kraushaar. September 16th, 1927. (290,885.)

24,700. "Composition for use in substitution for asphalt and bituminous materials and for electrical insulation." G. T. Fuery (Australian Bituminous Compounds, Ltd.). September 20th, 1927. (290,886.)

25,490. "Microphones, loud-speakers, and the like." De Forest Phonofilms, Ltd. October 29th, 1926. (279,807.)

27,195. "Electric lampholders." F. F. Guth. April 19th, 1927. (288,998.)

27,232. "Electrical measuring instruments." Etablissements E. Jaeger. October 15th, 1926. (Addition to 275,207.) (279,099.)

28,320. "Electroplating the surface of aluminium or aluminium alloys." C. H. R. Gower and S. O'Brien & Partners, Ltd. October 25th, 1927. (290,903.)

29,433. "Talking motion picture films." De Forest Phonofilms, Ltd. April 27th, 1927. (289,419.)

29,623. "Electric power transmitter." W. Fairweather (Singer Manufacturing Co.). November 5th 1927. (290,909.)

29,624. "Electric motor and transmitter unit." W. Fairweather (Singer Manufacturing Co.). November 5th, 1927. (290,910)

33,011. "Condenser arrangement for polyphase current installations." Siemens-Schuckertwerke Akt.-Ges. December 29th, 1926. (282,736.)

33,678. "Construction of single-phase transformers for electric welding." Ateliers de Constructions Electriques de Charlerol. January 4th, 1927. (283,131.)

33,954. "Automatic cut-outs for battery ignition systems of internal-combustion engines." F. Freeguard and F. O. Beisiegel. December 15th, 1927. (290,926.)

35,208. "Methods of, and apparatus for, treating filaments for electric incandescent lamps and the like." British Thomson-Houston Co., Ltd. December 31st, 1926. (282,812.)

#### 1928.

94. "Electrical coupling arrangements for use in high-frequency circuits." Marconi's Wireless Telegraph Co., Ltd. January 18th, 1927. (283,874.)

162. "Electric telephone installations." Soc. Anon. Hasler Ci-Devant l'Atelier des Télégraphes de G Hasler and E. Glaus. January 3rd, 1928. (290,937.)

377. "Radio-transmission systems." C. Lorenz Akt.-Ges. January 13th, 1927. (283,549.)

1,132. "Telephonic receiving apparatus for the aid of the deaf." T. B. Smith. January 12th, 1928. (290,943.)

1,594. "Radio transmitters." C. Lorenz Akt.-Ges. January 25th, 1927. (284,237.)

3,581. "Submarine signalling cables." Western Electric Co., Inc. February 27th, 1926. (Divided application on 268,714.) (284,733.)

7,364. "Sparking plugs." M. Heine (*née* Kubitza). March 9th, 1928. (290,957.)

7,598 "Warning signals for vehicles." International General Electric Co., Inc. March 12th, 1927. (287,062.)

10,723. "High-frequency circuit arrangements, radio transmitters and the like." Marconi's Wireless Telegraph Co., Ltd. May 5th, 1927. (289,875.)

# Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 6th:—

The S.S. Sanafone (lettering and design) No. 480,991. Class 8. Speaking tubes and mouthpieces for use with telephones and the like D. S. S. Steuart, St. Mark's Square, Regent's Park, N.W.1.

Seraphone. No. 490,150. All goods in Class 8.—S. J. Wainright, 17, Westbourne Street, W.2.

Silent Service Sircator (lettering and design). No. 490,406. Class 8. Electrical apparatus for use in offices for receiving at a distance the names and other matters descriptive of callers desiring interviews.—G. J. W. Evans, trading as Geo. Evans & Co., 54, Albany Street, Regent's Park, N.W.1.

Kermor. No. 489,417. Class 18. Heating and lighting apparatus. Adrien Maure, Orleans, France. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Emlin. No. 489,927 Class 50. Substances composed of textile materials of paper or of mica treated with oil, varnish or similar substance for use as electrical insulators.—H. D. Symons & Co., Ltd., Park Road, Kingston Hill, Surrey.

# New Work for Contractors.

**Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.**

*Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

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ASHFORD (KENT).—Re-erection of saw mills, for A. C. Crothall.

AUDENSHAW.—Development, Ryecroft Hall estate; U.D.C. surveyor.

AYRSHIRE.—School at Cronberry; clerk, Education Authority, Ayr.

BIRKENHEAD.—208 houses, Higher Bebington; Lloyd and Cross, Ltd.

BLACKPOOL.—Reconstruction of premises, Marshall Street and Kent Road, Revoe, for Blackpool Central Conservative Working Men's Club and Institute, Chadwick Street, Revoe.

BLACK ISLE.—Housing scheme (30), for the District Committee; D. Matheson, architect, Dingwall.

BOLTON.—'Bus garage, Crook Street; Corporation tramway department. Extensions, Picture House, Regent Kinema, Deane Road; Bolton Moor Kinema, Ltd. Engine and pump house, Bridgeman Street; Anglo-American Oil Co., Ltd. Extensions, Peel Mills, Turton Street; Knowles, Ltd. Elementary school, Whitecroft Road; Education Committee.

BURY ST. EDMUNDS.—Out-patients' department, West Suffolk General Hospital; Nash & Mitchell, architects, 7, Hatter Street (returnable deposit of £2 2s.).

CHELTENHAM.—Extensions, nurses' quarters, General Hospital, Sandford Road; Governors. 68 houses, Davis site; J. H. Thompson & Sons, Ltd.

COLEFORD.—Additions to police station, Coleford, for Gloucestershire C.C.; E. S. Sinnott, county surveyor, Gloucester (returnable deposit of £2 2s.).

CONGRESBURY (WESTON-SUPER-MARE).—Flour mills, for J. H. Walter & Sons.

COVENTRY.—Housing scheme (304), for the T.C.; borough surveyor. Church (Anglican); Bishop of Coventry.

COXHOE (Co. DURHAM).—Cinema, Blackgate, for Fred and Thomas Iseton (£4,000-£5,000).

CROYDON.—Block of business premises, London Road, and model dairy, for the South Suburban Co-operative Society, Ltd.; secretary.

DUNOON.—Extensions to cottage hospital, including X-ray installation (£6,000), for the directors; secretary.

EDINBURGH.—George Watson's College (£160,000); J. B. Dunn, architect. Brass foundry at Milton Street, for Milne's Meters, Ltd.; the manager. Re-erection of confectionery works, Roull Road, Corstorphine, for J. M. Cameron.

EASTBOURNE.—34 houses, Cavalry Crescent; borough engineer. Concert hall, &c. (£38,500), for the T.C.; borough surveyor. Alterations, Glastonbury Hotel, Royal Parade; A. Ford, architect.

FERRYHILL (Co. DURHAM).—Church, The Broom; W. Arthur Kellett, architect, Barnard Castle.

GLASGOW.—New buildings (£300,000), for Scottish Legal Life Assurance Friendly Society (electric lighting, nine electric lifts, and labour-saving appliances), Wylie, Wright and Wylie, architects. Cabinet factory (£90,000), for Scottish Co-operative Wholesale Society; the manager, Shieldhall Works. Buildings for Glasgow Dental Hospital (£90,000); the superintendent. 400 houses for Corporation at Knightswood (£175,000); Director, Housing Department. Masonic Hall, for Lodge Eastmuir No. 1126; the secretary. New church and halls for St. John's and Renfield Street U.F. Church; the minister.

GOOLE.—Erection of club premises, for British Legion; F. Turner, architect.

HALIFAX.—Billiard hall and dance rooms; G. R. Oddy, architect, Ward's End Chambers.

HANDSWORTH.—Cinema, Soho Road and Booth Street, for H. A. Barber.

HEREFORD.—Alterations, Bath Street Flour Mills; Bettington & Son, architects, Palace Chambers.

HULL.—Nurses' home and admission ward, Mental Hospital; City architect. Estate development, Willerby; L.N.E.R. Estate Department, Hull. Rehousing scheme, 400 flats, various sites; City architect.

ILKESTON.—School, Cavendish Road (£20,250); David Roberts & Son.

IRISH FREE STATE (KILRUSH, Co. CLARE).—Reconstruction of District Hospital and the Fever Hospital; R. Dowling, 1, Bindon Street, Ennis.

KINGSTON-ON-THAMES.—School, Elmfield (£39,815), for Surrey E.C.; R. Monk, builder, Lower Edmonton. Offices and clinics, for the Borough E.C.; borough surveyor.

LEAMINGTON.—Extensions, Eagle Foundry; S. Flavel and Co., Ltd.

LEEDS.—153 houses, Myddleton estate; City architect. 86 houses, York Road and Selby Road estate; Paul Rhodes, Ltd.

LONDON (ISLINGTON, N.).—Covered accommodation, Pedlars market (£4,000); City engineer.

(BERMONDSEY, S.E.).—Offices, Raymouth Road; Telling Bros., Ltd.

(LEWISHAM, S.E.).—Rebuilding business premises, 122-130, High Street, for Marks & Spencer, Ltd., bazaar proprietors, London.

(WIMBLEDON, S.W.).—Public baths, dressing and club rooms and offices (£20,131), for the T.C.; Leslie & Co., Ltd., builders, Kensington Square, London, W.

(ACTON, W.).—Nurses' hostel, Heathfield Lodge estate; Acton Hospital Governors.

MALTBY (YORKS.).—Housing scheme (32), for the U.D.C.; surveyor (returnable deposit of £1 1s.).

MANCHESTER.—Additions, Primitive Methodist College, Withington; Hartly College trustees. 332 houses, Blackley estate; City architect. Additions, Synagogue, Wilbraham Road, Fallowfield; Hebrew trustees. Additions, Dance Hall, 199, Brunswick Street, Chorlton; Hall Company. Boys' secondary school, Chain Bar, Moston (£54,000); Director of Education, Education Offices, Deansgate.

MENSTON.—Operating theatre, Menston Mental Hospital; H. Topham, Clerk to the Mental Hospitals Board, Wakefield.

MERIONETH.—Isolation and small-pox hospital accommodation; county medical officer.

NORTH SHIELDS.—Re-erection of saw mills, electrically equipped, for Robson Miller Sawmills, Ltd. (£100,000).

PLYMOUTH.—'Bus garage extensions; A. & J. Main & Co.

SHEFFIELD.—58 houses, Wybourn estate; City architect. 81 houses, Ridgway Road; City architect.

SHIPLEY.—Extensions to Unionist Club (£2,000 estimate); secretary.

SMETHWICK.—78 houses, Vicarage site, 224 houses, Hedford Lane site; borough engineer. 14 shops, Thimblemill Road; S. Davies.

SOUTHEND-ON-SEA.—Church, Chalkwell Park, for the United Methodist trustees; Percy G. Hayward, architect, Broad Street Buildings, London, E.C.

STOCKTON-ON-TEES.—Works, for Power Gas Corporation Co. (Incorp. Chemical Industries, Ltd.). Hospital extension; borough engineer.

STOURBRIDGE.—Housing scheme (228), High Park Estate, for the T.C.; borough surveyor.

SUTTON (SURREY).—Houses (85), Sutton Common Road, for Fowles & Finch.

SWINTON AND PENDLEBURY.—Housing scheme (79), Beech Farm estate, for the U.D.C., to be erected by direct labour; surveyor.

TIPTREE (ESSEX).—Re-erection of portion of the Anchor Press Printing Works, for Hutchinson, Ltd. (£65,000).

WALSALL.—Further housing scheme (500); borough surveyor.

WALTON-ON-THAMES.—Houses (50), with electrical work, for the U.D.C.; Blackwell & Mayer, builders, Erith Road, Bexley Heath.

WARRINGTON.—Vagrant wards and nurses' home, for the B.G.; William & Segar Owen, architects.

WELWYN GARDEN CITY.—Church (£9,500); F. Palmer, builder.

WEMBLEY.—Secondary school, Forty Lane; Middlesex Education Committee.

WIDNES.—Additional 100 houses, Kingsway Estate, for the T.C.; borough surveyor. Re-erection of Golding Davies vitriol works, West Bank Dock, for the United Alkali Co., Ltd. (£60,000).

YORK.—64 parlour houses, 44 non-parlour houses, in Osbaldwick Lane; F. W. Spurr, city engineer, Guildhall.